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SOUTHWEST FISHERIES CENTER

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HONOLULU LABORATORY
Honolulu, Hawaii

INSULAR RESOURCES INVESTIGATION

Seamount Research Planning Meeting Held

Dr. George W. Boehlert, Chief, Insular Resources Investigation, developed a planning session to refine the objectives and to chart the scientific activities of the Seamount Resources Study Program. Boehlert conducted a background seminar on the scientific issues and the literature of the species of interest. The planning meeting was held on March 28 to 29. The meeting was facilitated by SWFC Planning Officer David J. Mackett, assisted by Samuel G. Pooley, Industry Economist. Participants besides Boehlert included Laboratory Director Richard S. Shomura; Drs. Jeffrey J. Polovina, Leader, Resource Assessment Investigation of the Mariana Archipelago Program; Jerry A Wetherall, Robert A. Skillman, Stephen Ralston, and Tim Gerrodette, and James H. Uchiyama and Reginald M. Gooding, Fishery Biologists. Research Assistants Robert L. Humphreys, Michael P. Seki, and Darryl T. Tagami served as observers and recorded the proceedings.

Boehlert and participants formulated four objectives for the Seamount Resources Study Program:

1. To understand the stock dynamics of pelagic armorhead, Pseudopentaceros sp., as a function of the historical fishery and to develop models which relate oceanographic and environmental data to variability in recruitment. This objective is linked to a specific fishery related objective, namely to estimate potential yield as a function of stock size and to predict recruitment as a function of stock size and physical factors.

2. To understand the ecological and trophic importance of seamounts to pelagic armorhead and its ecological relationship to other key species in the seamount ecosystem.

3. To understand the role of physical mechanisms, oceanographic conditions, seamount characteristics, and biological conditions under which high standing stocks of fishery resources are maintained over seamounts.

4. To develop quantitative seamount ecosystem models to allow testing of hypotheses developed under objectives 2 and 3.

For the purposes of the planning workshop, the participants concentrated on those objectives related most specifically to the pelagic armorhead resource. Although research on a variety of seamounts will be conducted during the Seamount Resources Study, emphasis will be on the Hancock and the southern Emperor Seamounts.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

After deciding upon the program objectives, the participants generated ideas for activities necessary to meet the objectives. The activities were placed into a logical order for development of a PERT chart. Plans were made for a 5-year field program and a sixth year for analysis, which corresponds to the 6-year moratorium on fishing at Hancock Seamounts recently proposed by the Western Pacific Regional Fishery Management Council. Thus, the recovery of the pelagic armorhead stock will be monitored as part of an overall scientific program. The meeting adjourned with the understanding that Boehlert and his group would refine the chart and then work with Mackett to estimate the time and resources necessary to conduct the activities necessary to achieve the objectives. (G. Boehlert (808) 943-1221)

NOAA Research Vessel Completes Studies of Seamount Fishery Resources

Two unusual fish, the pelagic armorhead and the red-colored alfonsin, found over the submerged mountain ridges, called seamounts, of the central North Pacific are eagerly sought and highly prized by Japanese and Soviet fishermen. Study of these fishery resources and the collection of biological and oceanographic data from waters over and surrounding the seamounts was the primary mission of the fishery biologists from the National Marine Fisheries Service' laboratory in Honolulu working aboard the National Oceanic and Atmospheric Administration (NOAA) ship, Townsend Cromwell, during a 52-day cruise which ended on March 8, 1985.

Chief Scientist Robert L. Humphreys, Jr. of the Southwest Fisheries Center's Honolulu Laboratory reported that investigations were conducted at NW and SE Hancock Seamounts and at an unnamed seamount designated as Seamount 11. These seamounts are all located in the extreme northern region of the Hawaiian Ridge beyond Kure Atoll and are included within the limits of the U.S. 200-mile Fishery Conservation Zone.

Fishery resources on the seamounts were first discovered in 1967 when the Soviet trawler, Astronom, caught large quantities of pelagic armorhead and smaller amounts of another fish species, the alfonsin, over the seamount summits. Both of these fishes are not known to occur around the main Hawaiian Islands.

Soon after the 1967 discovery, a Soviet trawl fishery began at the seamounts and in 1969 the Japanese joined them in fishing for these resources. It has been estimated by fishery scientists at the Honolulu Laboratory that the Japanese and Soviets together took about 1 million metric tons of alfonsin and armorhead during the first 8 years of the fishery.

At this time no U.S. fishermen have become involved commercially in this fishery although there have been recent expressions of interest by a U.S. trawler

During the past 9 years, however, trawl catches of armorhead have declined and Richard Shomura, Director of the Honolulu Laboratory, has recently recommended to the Western Pacific Fisheries Council that

seamounts within the U.S. Fishery Conservation Zone be closed to foreign fishing.

Humphreys noted that during the recent cruise of the Cromwell, scientists aboard ship tried fishing the summit and upper slope areas of the seamounts with modified longline gear. Although the trawl fishery for armorhead over the seamount summits is primarily a night fishery, during daylight hours armorhead catches were made at the edge and just below the edge of the summit. The biologists were also able to successfully collect the young of armorhead from surface waters around both Hancock Seamounts. Other studies made by the scientists aboard the Cromwell involved the collection of free-drifting and small actively swimming organisms both over and away from the Hancock summit. (R. Humphreys (808) 943-1221)

FISHERY MANAGEMENT RESEARCH PROGRAM

Report on Spiny Lobster Fishery Completed

Dr. Robert A. Skillman, Leader, Fishery Management Research Program, has completed a quarterly report on the Northwestern Hawaiian Islands (NWHI) lobster fishery. The report was requested by the Executive Director of the Council. This report provides a computer-generated summary of catch and catch per trap-night for legal, sublegal, and berried spiny lobster, slipper lobster, and kona crab by island and month for the first quarter of 1985; the 1985 results are compared with 1984 results. Catches of legal spiny lobster are running ahead of the 1984 catches, especially for slipper lobster. Also the catch per trap-night has declined from 2.00 legal spiny lobsters to 0.80 for the first quarter. The catch rate for slipper lobster remains essentially unchanged.

To collect more data on the spiny lobster fishery, Research Assistant Victor A. Honda departed as an observer on the lobster boat, Kona Kai. Honda will collect additional data on the conversion of spiny lobster carapace length to a new tail width measurement for the minimum size regulation in the NWHI spiny lobster fishery. During the 2-month trip, Honda will also collect data on catches of sublegal and berried lobster and various operational data. Research Assistant Roy L. Bendell, who was recently hired, departed on April 30 to collect similar data on the Alaska Gulf. (R. Skillman (808) 943-1221)

Catch Statistics Analyzed

Dr. Skillman and Gary L. Kamer, Statistician, completed a draft report on the comparison of the catch and catch per unit statistics of pelagic management unit species caught by domestic longline, troll, and deep-sea handline gear and Japanese tuna longline gear. The report was submitted for review to the Council's Pelagic Plan Development Team.

The study indicated that (1) the domestic statistics provide usable estimates of the abundance of species that are commercially and recreationally important, (2) the domestic and foreign fisheries are

operating on common stocks of blue and striped marlins, (3) events affecting abundance of the blue and striped marlin resources as a whole are reflected in that portion of the stock available to the local fishery, (4) increasing Japanese effort is associated with decreasing stock abundance of blue and striped marlin available to the local fishery, and (5) this association is stronger in areas closer to Hawaii. Thus, as other studies have also indicated, the foreign and domestic fisheries operate on common stocks of blue and striped marlin, and foreign fishing is associated with the success of domestic fishing for blue and striped marlin; the statistical tests for the association of catch, effort, and abundance are weakened, however, by a poor understanding of the biology of the resources and the large variability in the statistics. (R. Skillman (808) 943-1221)

Technical Subcommittee Meeting Held in Honolulu

The third series of meetings of the WPACFIN Fisheries Data Coordinating Committee's Technical Subcommittee was held at the Honolulu Laboratory during the week of April 22. Representatives from American Samoa, Guam, Hawaii, and the Commonwealth of the Northern Mariana Islands (CNMI) were present. Some of the accomplishments of the meeting included: the identification of needs for hardware and software and upgrades to the Saipan Offshore Expansion System, and an addition of a requirement to collect species composition data to the CNMI creel survey. Also, the representatives of American Samoa decided to implement a creel survey similar to that of Guam and the CNMI. Therefore, WPACFIN's development of a data expansion system for American Samoa will be based on a straightforward modification of the Guam Offshore Expansion System. (D. Hamm (808) 943-1221)

PELAGIC RESOURCES INVESTIGATION

Monk Seal Population Size Estimated

The principal data available for estimating the size of the endangered Hawaiian monk seal population are counts of seals hauled out on beaches in the NWHI. It has been difficult to estimate population size from these data because the fraction of seals hauled out at any time is not known.

Dr. Tim Gerrodette, Fishery Biologist, Pelagic Stock Assessment Task, has recently developed methods which exploit new information on haul-out behavior and make it possible to estimate populations for the first time. The haul-out data were collected for monk seals of both sexes and different age groups during the summer of 1983 at Lisianski Island by members of the Marine Mammal and Endangered Species Program. With the assumption that the haul-out patterns at other islands were the same as at Lisianski, Gerrodette used beach counts throughout the archipelago to derive an overall population estimate of 1,488 seals for the summer of 1983, with 95% confidence limits of 1,417 and 1,559. This estimate may be compared with the raw beach counts, which have averaged around 500 seals in recent summers. The population estimate is considered preliminary, and involves a

number of critical assumptions about the seals' behavior which need to be tested. (J. Wetherall (808) 943-1221)

Yellowfin Tuna Successfully Tracked off Windward Oahu

Dr. Richard W. Brill, Leader, Tuna Behavior and Physiology Task, reports that efforts to catch and track yellowfin tuna, Thunnus albacares, associated with fish aggregating devices (FAD's) were centered around the FAD's off windward Oahu in April. The objective of tracking the tuna was to obtain data that could be compared with the extensive data set already available on movements of yellowfin tuna off leeward Oahu. Unfortunately, the almost constant rough sea conditions on the windward side of the island made fishing and tracking in the small 10-m (33-ft) research vessel difficult. The Hawaii Institute of Marine Biology (HIMB) on Coconut Island (located in Kaneohe Bay on windward Oahu) kindly provided dockage space for the R/V Kaahele'ale during this work.

Research Assistant Robert E. Bourke, Lt. (jg) Jeffrey A. Koch, NOAA Corps, and Dr. Kim Holland, HIMB, spent 5 days (and 1 night) fishing near U and W FAD's before they caught a 44-cm (fork length) yellowfin tuna. The fish was caught at dawn and remained in the immediate vicinity of the FAD's until sunset when it was lost due to apparent failure of the transmitter. Although the tuna was tracked for only a short time, the vertical and horizontal movements of this fish were very similar to those of fish tracked around the FAD's located off leeward Oahu. Therefore, data obtained on fish associated with leeward FAD's do not appear to be absolutely site specific. (R. Brill (808) 943-1221)

COASTAL FISHERIES RESOURCES DIVISION
La Jolla, California

COASTAL EASTERN PACIFIC POPULATION BIOLOGY OF FISHES

Anchovy Spawning Habitat Defined at Selected Sites

The first field experiment to link environmental characteristics with parameters of larval anchovy growth and survival was conducted by Coastal Division members from the NOAA Ship David Starr Jordan during March under the scientific leadership of Dr. Robert Owen. The research combines several new methods developed by scientists at the Southwest Fisheries Center which characterize likelihood of survival in larval fish. In this experiment, age-specific survival of anchovy larvae will be compared with conditions of the environment in which adult anchovy have demonstrably chosen to spawn. From samples collected on the cruise, age-specific larval survival is to be specified from incidence of starvation, recent growth rate, proximal lipid content, and apparent mortality derived from larval life-tables. Environmental conditions are to be specified from samples taken to determine concentrations of larval forage and predators, and from data obtained on the degree of vertical mixing, lateral transport, chlorophyll concentration, concentration and composition of other phytoplankton pigments, physical structure of the water column, and local variations of these.

Two spawning sites that differed in environmental properties were selected and sampled repetitively at each site. To minimize the potentially large differences due to advection, sampling sites were centered on each of two surface drifters which had been released at both sites.

The first site chosen was in the wind and wave shadow east of San Clemente Island where intense spawning activity by anchovy was evident from egg scans taken by fishery biologist Bill Flerx on the preceding biomass survey. At 33.08°N, 118.23°W, the first of two radio-transmitting surface drifters was released. The second drifter then was released about 8 n.mi. east of the first, at 33.15°N, 118.09°W. A pattern of four stations was occupied around each drifter in turn. The stations were at sites N, S, E and W of each drifter at a nominal distance of 2 km. from the drifter. Drifters were located using a radio direction finder, and their observed positions were determined by radar or satellite navigation systems. Once the requisite number of stations (50) was completed at the first site, the drifters were retrieved about 20 n.mi. east of where they were first released. The research vessel, Jordan, then proceeded to locate the second site.

The target area for the second site was about 150 n.mi. southwest of San Clemente Island in a patch of warm water (as indicated by a March 17 satellite image of sea temperature made available by Dr. Paul Fiedler, Oceanographer at the Center. About 25 hours (including running time) were spent making exploratory tows, but only a few larvae were found in an area

where high spawning was evident two weeks earlier. Proceeding north to another likely offshore site, the Jordan eventually encountered anchovy eggs at consecutive 4 mi. stations, and the sequence described above was repeated. The second set of drifters was recovered about 40 n.mi. southeast of their points of release.

A number of contrasts are immediately apparent between environmental conditions at the two sites. The first spawning site can be distinguished from the second by low versus high vertical wind mixing; slow, erratic, meandering onshore flow versus fast, consistent, longshore flow; high concentrations of copepods and microplankton versus salps; shoal versus deep mixed layer; shoal versus deep euphotic layer; high versus low local variations of plankton biomass, and perhaps also of plankton composition.

Current activities involve sorting fish larvae from the plankton samples by a sorting group working under J. Thrailkill to determine the incidence of larval starvation by histological methods (G. Theilacker and P. Paloma) determination of larval age and recent growth rate by otolith analysis (J. Butler and S. Longinotti); analysis of larval feeding condition by lipid analyses (J. Hakanson, SIO), and determination of larval mortality by life-table analysis (N. Lo). Processing and analysis of oceanographic data are underway by Owen and Bliss. Predation pressure will be estimated from enumerations made by Dr. A. Alvariño, and forage supply will be calculated through counts of the microplankton community by S. Hamer, P. Paloma, P. Schmitt and R. Owen.

Participating in this exercise were K. Bliss, NMFS, J. Butler, NMFS, D. Gruber, NMFS, S. Hamer, NMFS, S. Longinotti, SIO, Dr. P. Schmitt, NRC Fellow, G. Theilacker, NMFS, J. Metoyer, NMFS, Cruise Leader, and Dr. R. Owen, NMFS, Chief Scientist. (R. Owen, FTS 893-6232)

Sardines Induced to Spawn in the Laboratory

Fishery biologist Roger Leong artificially induced spawning in the Pacific sardine, Sardinops sagax, on several occasions in April thus making the routine spawning of sardine on demand in the laboratory a reality. This important advance will make possible for the first time verification of the occurrence of daily increments on sardine otoliths which is used to estimate the age of larval and juvenile sardines, assessment of the rate of postovulatory follicle resorption rates, used to estimate spawning frequency parameter in the egg production method of biomass estimation, and documentation of the rate of embryonic development, an important step in the egg production method of biomass assessment.

The fish spawned after two injections: an initial injection of 250 units of chorionic gonadotropin and a second (24 hours later) of 20 mg. of carp pituitary with 200 units of gonadotropin from pregnant mare serum added. This injection recipe resulted in the production of eggs of suitable quality for laboratory rearing studies.

Hatching occurred at about 48 hours after spawning (17.5°C) and yolk absorption was nearly complete 4 days after hatching. The larvae, reared for over 30 days on a diet of cultured rotifers and copepods, grew about 0.5 mm. per day with the largest larva being 18 mm. The eggs were

regularly sampled to determine rates of embryonic development by biologist Dennis Gruber. Larvae sampled for validation of otolith age determination and 25 ovaries were taken at various times after spawning by Beverly Macewicz, Histopathology Technician, to document the resorption of postovulatory follicles. (R. Leong, FTS 893-6262)

Simulation Study Conducted to Test Adequacy of the Current Sampling Effort for Mortality Estimation of Anchovy Larvae (< 20 Days Old)

Each year, anchovy larvae samples are collected during routine CalCOFI (California Cooperative Oceanic Fisheries Investigations) survey. The larvae sampled are measured and counted, and the catches are corrected for net extrusion and avoidance. Age is determined by length according to a general growth curve. Larval abundance per unit water volume in age is then used to estimate daily age-specific instantaneous mortality rate ($z(t) = B/t$) assuming a steady state. Although the current estimation procedure provides the measurement of precision of the estimate of mortality coefficient (B), it is difficult to assess the quality of the measurement due to the complexity of the estimation procedure. A simulation study was initiated, therefore, by Dr. Nancy Lo, Mathematician, to evaluate the accuracy and precision of mortality estimates, to determine minimum sample sizes needed for detecting changes in mortality rates, and to investigate the effect of deviations in larval growth on mortality estimates.

In this simulation model, a pseudo population of anchovy larval standing stock was created using 1984 larval data, and the routine survey pattern was followed. For each tow, random extrusion and avoidance was built into the model to produce actual catch. The current mortality estimation procedure was then used to compute an estimate of mortality coefficient (B). This model allowed the selection of number of tows (n), month(s), region(s), mortality coefficient (B), growth rates and number of repetition (m) of sampling. Each repetition produced an estimate. Variances of the estimates were computed from m repetitions (m ranges from 25 to 100), and were used to determine minimum sample size.

The initial results indicate the minimum sample size for a given precision of the estimate and the minimum sample size needed to detect specified differences in mortality. Analysis of the sensitivities of mortality estimates to changes in larval growth rates is under way.

The analysis indicates that a minimum of 215, 55 and 25 tows (approximate 70% of which are positive tows) is required over the first 4 months of spawning to estimate the mortality coefficient (B) for the entire population with a coefficient of variation (cv) of B of 0.05, 0.10, and 0.15 respectively.

Data from inshore areas were used to determine the minimum sample size needed to detect differences in mortality rates because the inshore areas contain larvae of all sizes whereas the offshore areas do not. The critical issues in comparing mortality rates appears not to be one of precision but rather those related to biases such as difference in larval growth, and whether or not the samples are representative of a region, or entire population, or of a season. (N. Lo, FTS 893-6218)

Progress Continues in Definition of Parameters to Identify Condition of Field-Collected Fish Larvae

Fishery biologist Gail Theilacker continues to define parameters that identify the condition of field-collected fish larvae. In the current study, young anchovy are being analyzed. This study was designed to determine diet-induced differences in growth and morphology, to correlate feeding history with the histological condition of tissues, and to determine the persistence of these diagnostic, histological characters.

Five groups of anchovy were reared for 3 weeks. The control was fed at the time of yolk absorption and feeding was delayed 1 to 4 days in the other groups. As expected, increasing periods of starvation produced a decrease in fish size at a common age. Results from the growth study show that not only does a day of starvation cause a decrement in size at age, but it also causes a decrement in growth rate after feeding resumes.

Pete Paloma, Fishery Biologist, is grading the histological characteristics of the larval anchovy tissues. The onset of starvation in anchovy is identified by changes in the histological characteristics of the brain, cartilage, musculature, pancreas, liver and gut. Paloma's results are preliminary, but a pattern seems to be developing that will allow Theilacker and Paloma to discriminate among healthy larvae, starved larvae, and larvae in which feeding has been delayed or intermittent. It is important that this laboratory calibration determine the persistence of these diagnostic characteristics. Durations are needed to estimate size-specific mortality rates of field-collected larvae using the histological examination.

Jack Metoyer, Biological Technician, measured standard length, head length, body depth and eye diameter of all larvae from all feeding treatments. From previous experiments, Theilacker expects the sizes of the body parts to differ between the feeding and starving groups. A morphometric analysis of larval fish condition, based on a stepwise discriminant analysis, will be run using all the above body measurements. (G. Theilacker, FTS 893-6331)

COASTAL EASTERN PACIFIC FISHERIES ENVIRONMENTAL INVESTIGATIONS

Azores Fishermen Trained in Alternative Tuna Fishing and Location Methods

Ron Dotson, Fishery Biologist, on loan to the Food and Agriculture Organization (FAO) of the United Nations, recently returned from participation in a 3-month Technical Cooperation Project in the Azores.

The Azores are a group of nine islands belonging to Portugal located on the mid-Atlantic ridge 800 miles west of the Portugese mainland. The traditional tuna fishery is by pole and line during the months of April through August or September. The remainder of the year the tuna vessels are dry-docked and the fishermen turn to other fisheries or agriculture for work. The objective of the project is to train local fishermen in the use

of alternative fishing gears and methods to increase the length of their fishing season, and thereby increase revenue and employment. This project is similar in design and scope to the mid-winter albacore longlining conducted by the American Fishermen's Research Foundation with NMFS-controlled Saltonstall-Kennedy funds in the past 4 years.

As a master fisherman for FAO, Dotson made one trip to the Azores in January 1984 to survey vessels and ascertain equipment requirements. The main project took place during September-December 1984. Working with the staff of the Regional Secretary of Agriculture and Fisheries and the University of the Azores, Dotson outfitted a vessel with trolling and longline gear, purchased by the Portugese government. Two weeks were spent in assembling the gear and training crew and technicians in its construction.

Longline fishing trials started on October 6 and continued until November 29. A total of 13 sets were made, ranging from 447 hooks to 985 hooks per set. Ten of the sets were daytime sets placed at the thermocline to target tuna and three surface sets were made at night for swordfish. The total fish caught in the 13 sets included: 10 bigeye tuna (Thunnus obesus), 3 albacore (T. alalunga), 3 skipjack (Katsuwonus pelamis), 16 swordfish (Xiphias gladius), 162 blue shark (Prionace glauca) and 28 mako shark (Isurus oxyrinchus), plus 10 miscellaneous fish and one turtle. Trolling along the line after it was set produced 1 albacore and 1 bigeye tuna.

Weather conditions were generally poor, with frequent and persistent storms and gale force winds which prevented fishing or restricted efforts to near island banks. Good quality bait was also difficult to obtain, with poor handling, unavailability or improper size of baitfish contributing to the slowing of fishing efforts and decreasing catches.

The personnel trained by Dotson will continue fishing experiments during the spring and early summer months using both longlining and trolling methods. Catches of swordfish in initial tests indicate the potential for a productive fishery on this previously unexploited Azorean resource. Catches of tuna appear to be dependent on the location of oceanic frontal boundaries away from banks or seamounts adjacent to the islands. Trolling catches are expected to be good during spring months before pole and line fishing becomes highly productive.

Dotson returned to the Azores in March to present the initial results of the project at the Fifth Annual Fisheries Week seminar, sponsored by the Regional Secretary of Agriculture and Fisheries. (R. Dotson, FTS 893-6270)

SWFC Scientists Assist in Development of Longline Fishery for Albacore Tuna

The Resolute, on a fuel subsidy from Saltonstall-Kennedy (S-K) funds awarded to the American Fishermen's Research Foundation (AFRF) in San Diego, conducted exploratory longline fishing operations for albacore tuna during November and December 1984. Fishing results indicate that the U.S. albacore fishery can be extended to operate during winter months using

longline fishing methods in an area where the fleet has not traditionally fished.

This study is being conducted cooperatively between the National Marine Fisheries Service Southwest Fisheries Center (NMFS SWFC) and the U.S. albacore fishing industry through AFRF. S-K funds managed by the NMFS Southwest Regional Office in Terminal Island, California, and awarded to AFRF were used to defray fuel expenses of the vessel. The operational aspects of the study were carried out by the AFRF and managed by the Western Fishboat Owner's Association, a west coast association of albacore fishermen. Fishery scientists at the SWFC assisted in planning and organizing the study. In addition, the SWFC provided scientific equipment and a biologist aboard the fishing vessel to make scientific observations and to keep detailed records related to the fishing operations and catch.

The goal of this fishery development study is to evaluate the potential for establishing a U.S. fishery on albacore tuna during winter months in eastern North Pacific waters. The purposes of the field studies are (1) to conduct exploratory fishing using longline fishing methods to determine if sufficient catches of albacore can be made to support an expansion of the fishery, (2) to make scientific observations to determine oceanographic conditions that may influence albacore distribution and catchability in the area, and (3) to collect scientific data for biological and fishery studies.

The vessel made 21 sets in an area about 1,250 miles west of Point Arguello, California. The number of hooks ranged from 239 to 1,425 per set and averaged a little over 1,000 per set at a targeted depth of 200 feet in and about the thermocline. A few scattered albacore were also caught by trolling while the vessel was in transit to the longlining area. Totals of about 36,000 pounds of albacore and 4,000 pounds of bigeye tuna were caught by the vessel.

The albacore longline catch ranged from 3 to 139 per set and averaged 73 albacore per set. The mean catch rate per 100 hooks was 7.2 for albacore and 7.5 when bigeye tuna was included. The mean catch rate of 7.5 tuna per 100 hooks is higher than the catch rate for any charter/fuel subsidy vessel that participated in this study. It also exceeds the highest catch rates published by the Japanese for this area and season.

The average weight of the albacore caught by longline was 22 pounds, range 5-77 pounds, which is nearly 10 pounds heavier than the average weight of albacore caught by jig fishing during the summer albacore fishing season in waters along the coast of North America.

The Resolute made use of several modifications in gear and operating methods that have been developed during the albacore longline fishery development study. These included alterations to reduce gear tangling and the use of an all monofilliment longline. The adoption of these procedures resulted in (1) a significant increase in catch rate, (2) a significant decrease in fish loss, and (3) a reduction in labor to set and retrieve the gear. Table 1 shows a comparison of the performance of the Resolute made in 1984 with that made during the survey in 1982. The results of these

operations are now being analyzed by scientists at the SWFC under the direction of Dr. R. Michael Laurs.

Table 1. Comparison of performance made by Resolute in 1982 and 1984.

Category	1982	1984
Type of gear	3-strand, 5/16-in. nylon mainline, fixed gangions	500 lb. mono. mainline, snap-on gangions with swivels
Winds > 20 kts.	35% of survey period	60% of survey period
No. of sets	19	21
No. of hooks/set	290-1,434	239-1,425
Average tuna catch rate	0.95/100 hooks	7.5/100 hooks
Tuna loss	51%	4%

(R. Laurs, FTS 893-6274)

Migration and Distribution of Albacore Linked to Variations in Large-Scale Oceanic Characteristics

In an attempt to analyze the relationship of patterns in the migration and distribution of albacore to variations in large-scale oceanic characteristics, fields of sea surface temperature (SST) gradients have been calculated for the North Pacific by oceanographers Ronald Lynn and Ken Bliss. The data fields used in this study are taken from the synoptic marine weather reports which have been archived at the La Jolla Laboratory for years prior to 1982 and are updated by a collection system at the U.S. Navy's Fleet Numerical Oceanographic Center and the Pacific Environmental Group of the Southwest Fisheries Center and the Pacific Environmental Group of the Southwest Fisheries Center. Gradients have been calculated for the 20-year means of SST for each of the 12 months and for individual months of years selected because they exhibited extremes in albacore catch statistics. The magnitudes of horizontal surface gradient are calculated using temperatures resolved at one-degree squares of latitude and longitude. These values have been plotted in contoured fields on maps of the North Pacific. Lynn and Bliss have made the following observations:

The largest gradients occur off the east coast of Japan at the confluence of the Oyashio and Kuroshio Currents and extend eastward in a zonal band centered about 41°N. This band of high gradient is delineating the subarctic front. In the eastern North Pacific the gradient diminishes below the minimum value chosen for contouring, 0.8°/100 km.

A secondary maximum occurs seasonally in the western and central North Pacific at bout 28°N, the latitude of the subtropical front. The gradient, at values greater than 0.8°/100 km., is found in winter and spring (with the curious exception of February) and disappears in summer and fall. This cycle is in concert with the strengthening and weakening of the local convergence calculated from the curl of the wind stress.

The primary maximum in SST gradient is not directly associated with the wind patterns and shows only small changes with seasons. In the western and central North Pacific its zonal position does not change but the value at lobes of maxima do alternate seasonally. This pattern suggests a standing wave in the current field dynamics and seasonal variation in the strength of the current.

In the eastern North Pacific the eastward extension of the primary zonal maximum does exhibit seasonal development. It extends farthest east in June and July, a period in which albacore are migrating into the U.S. west coast fishery. This extension is weakest in winter months. There is a tendency for this feature to occur farther north in September than in other months.

There is a strong annual cycle in the gradients off the U.S. west coast. A buildup in gradient occurs in June, peaks in July and August and starts to weaken in October. This pattern follows the annual development of the albacore troll fishery in this region.

It has been repeatedly demonstrated that albacore are associated with frontal features in the ocean including their aggregation at small-scale local features and their distribution and migration along large-scale ocean fronts. While this study is still in its preliminary stages, it is apparent that these gross patterns in SST gradients do not explain some of the large-scale distributions of albacore at all seasons. It is necessary to consider the temperature ranges associated with the gradient extremes; in some seasons the temperatures at the fronts are outside and limits considered to be appropriate for albacore. Past studies have also shown that there are multiple fronts in bands across the North Pacific, some of which have stronger salinity gradients than temperature gradients and show stronger subsurface gradients than surface gradients. Some of these important features do not appear in the SST gradient fields. Present plans call for integrating the results of the SST gradients analysis with our knowledge of salinity patterns and mixed layer depth to create an overall description of the mean seasonally varying albacore environment.

The results of plotting monthly SST gradients for the study of interannual variation are less clear. The level of noise in relation to pattern recognition is high. It is not evident whether this is caused by the resolution of the data collection and processing or by the nature of the ocean itself. More effort is needed to decide whether there is an interannual variation that might relate to variations in the distribution of albacore. (R. Lynn, FTS 893-6279)

COASTAL AND PACIFIC FISHERIES RESOURCES INVESTIGATIONS

U.S.-Soviet Research Cruise Completed

Since 1969, fishery biologists from the Southwest Fisheries Center in La Jolla have joined their Soviet colleagues in a cooperative fisheries survey in waters off the California coast. Dimitry Abramenkoff, a Russian-speaking fishery biologist at the Southwest Fisheries Center and a veteran of past cooperative cruises on Soviet research vessels, worked with Soviet scientists on the Mys Babushkina from March 14 to April 11, 1985, collecting biological samples to estimate the abundance of commercially important fishes such as the northern anchovy and Pacific hake.

The information derived from the Soviet research cruise is considered the most up-to-date and reliable check on the status of the hake population before the start of the fishing season. The Pacific Fishery Management Council, which is responsible for managing U.S. west coast fisheries within the 200-mile limit, will consider the data collected during the cruise when establishing this year's limit for hake fishery. The limit on catch is part of an effort by the Council to protect the hake population from overfishing.

Figure 1. D. Abramenkoff, SWFC Fishery Biologist, scans samples for hake and anchovy eggs and larvae.

Figure 2. Soviet hydrologists draw oxygen samples.

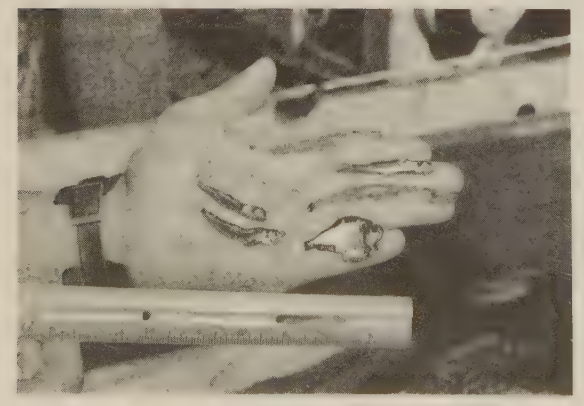

Figure 3. Samples taken from one of the trawls.

Figure 4. Soviet scientists with a trawl of hake.

The U.S. as well as the Soviets have a stake in assuring the continued abundance of the hake fishery. For the past 8 years, Soviet processing ships have worked with U.S. fishermen off the Pacific Northwest who trawl for hake and then deliver the fish for processing aboard Soviet ships for ultimate consumption by Soviet citizens. These "joint venture" fishing operations benefit American fishermen by providing a market for hake (which has little market appeal for American consumers) and benefit the Soviets, chronically short of high quality protein foods, who cannot operate within the U.S. 200-mile zone unless they are directly supporting American fishermen.

Using fine-meshed, nylon plankton nets, workers took tows at each biological station. One-half of the resulting sample was retained by the Soviets and the other half was preserved and boxed for sorting at the Southwest Fisheries Center in La Jolla. From the numbers of anchovy and hake eggs and larvae collected in the samples, fishery biologists will estimate the size of the year's spawning stock of these two species. The annual estimates are an important part of the effort to prevent the overfishing of these stocks. Information gathered during the cruise of the Soviet research vessel will augment similar data collected each year on cruises conducted by the Southwest Fisheries Center and the California Department of Fish and Game.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION

SWFC Hosts Scientific Meeting on the Effects of Oil Exploration with Seismic Air Guns on the Eggs and Larvae of Fish in the Coastal Zone

Dr. Paul Smith, Fishery Biologist with the Coastal Division, was host to the Eggs and Larvae Committee of the seismic surveys mediation effort April 17-19 at the Southwest Fisheries Center in La Jolla, California. Members of the Eggs and Larvae Committee were here to initiate research to determine the damage done to commercial fishing operations by seismic surveys. A previous committee was concerned with the effect of seismic operations on fish behavior and related changes in fishing success.

The Scientific Panel was chaired by Smith; members of the Scientific Panel were suggested by Smith and others and selected by the Eggs and Larvae Committee.

There were 3 days of meetings. The first day was for the public, scientists and committee members to comment on a description of the current state of knowledge by several scientists; the second day was for the Scientific Panel to discuss informally research programs to establish and quantify effects of seismic surveys on eggs and larvae; and the third day was for the Scientific Panel to arrive at consensus approaches to writing requests for proposals to test hypotheses on seismic damage to commercially valuable populations.

Participants at the meeting were: (left to right) Dr. Paul E. Smith, Dr. Gary Brewer, University of Southern California, Dr. Don Krotser, Minerals Management Service, Dr. Geoffrey Moser, SWFC, Mel Odemar*, California Department of Fish and Game, James Slawson*, Southwest Region National Marine Fisheries Service, D. W. Chamberlain*, Atlantic Richfield Co., Alana Knaster*, Mediation Institute, Dr. D. Van Holliday, TRACOR, Alan Hur*, Pacific Fishermen's Federation, Professor Marc Mangel, University of California at Davis, Dr. Elizabeth Clarke, Oregon State University, Dr. Rick Pieper, University of Southern California, Dr. Rick Methot, Southwest Fisheries Center Coastal Division, Craig Fusaro, Liaison Office, John Lane, Minerals Management Service, Joyce Bradley*, State Lands Commission, Craig Wengert*, Minerals Management Service, Dr. Roy Johnson, Atlantic Richfield Co. (Missing, Dr. Mark E. Huntley, Scripps Institution of Oceanography Marine Biology Division.)

*Member of the Eggs and Larvae Committee.

The conclusions of the group were that the most likely populations to be affected were the various rockfish populations of the continental shelf and continental slope and the lobster population. Eight candidate fish and shellfish groups were selected for study. Research activities proposed included: 1) mathematical modelling of population structure, acoustic damage, and survey pattern; 2) laboratory studies of actual acoustic damage to rockfish and lobster eggs and larvae; and 3) field studies of contained populations with actual seismic geophysical survey air guns. (P. Smith, FTS 893-6281)

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Report on 1982 PACFIN Research Data Base Published

In Administrative Report LJ-85-12 , entitled "Annual Report on the PACFIN Research Data Base--1982", Economists Cynthia Thomson and Dr. Daniel Huppert present wide ranging information on the landings, revenue and size of the Pacific coast commercial fishing fleet. The 1982 PACFIN Research Data Base, like the earlier 1981 version, contains data from commercial fish receipts and vessel registration records from the three Pacific coast states. Summary records for each vessel were designed to facilitate economics investigations regarding the fishing fleet.

The total number of commercial fishing vessels reported landing any amount fell by about 5% from 15,405 in 1981 to 14,628 in 1982. The reduction appears to be spread evenly across all vessel length categories. In both 1981 and 1982 about two-thirds of the commercial vessels represented in the data base land less than $5,000 worth of fish during the year. For most practical purposes, therefore, further investigations would focus on only a third or less of the "fleet."

Tables 1 and 2 illustrate some uses of the data base. A "principal" species and gear type may be assigned to each based upon the plurality of revenue. Table 1 shows the number of vessels associated with each species and species group for 1981 and 1982. In addition, the Table shows how the "fringe fishing fleet" (i.e. those vessels landing less than $5,000 worth of fish) differs from the larger commercial fleet in species targets. Examination of this and "principal gear" assignments reveals that the "fringe" fleet is largely active in salmon and rockfish fishing with troll and gill net gear.

The PACFIN Research data base was developed to facilitate comprehensive accounting for all fishing vessels regardless of State of registration. Consequently, the data base is uniquely able to reveal the number of vessels engaging in inter- and intra-state fishing activity as shown in Table 2. Nearly 90% of the vessels identified in the data base land fish in only one state. This is partly because the fleet is dominated by small, low-revenue vessels. Among the larger and more productive fishing vessels, however, inter-state activity is more prevalent. Thirty-one percent of trawlers and 40% of the albacore trollers engage in inter-state activity.

Due to the success in establishing the PACFIN Research data base and the emergence of several useful applications for it, Huppert is seeking support from the Pacific Coast Fisheries Data Committee to continue the project by adding 1983 and 1984 data during this calendar year. (D. Huppert, FTS 893-6261)

Table 1. Number of vessels associated with selected principal species groups in 1981 and 1982.

Species Groups*	Number of vessels Overall 1981	Overall 1982	With gross revenue greater than $5,000 1981	With gross revenue greater than $5,000 1982
Coho salmon	5057	5814	1221	1780
Chinook salmon	3553	2805	482	287
Pink and sockeye salmon	1210	879	598	563
Other salmon	334	385	77	126
Unspecified rockfish	842	913	228	260
Herring	284	327	284	298
Albacore tuna	832	364	543	207
Yellowfin tuna	91	66	77	63
Sharks	116	121	43	35
Billfish	143	201	86	140
Pink shrimp	210	148	200	142
Dungeness crab	822	739	557	469
Crustaceans	221	206	103	100
Northern anchovy	15	8	12	7
Mackerels	60	72	36	46
Echinoderms	208	189	131	126
Miscellaneous fish	340	313	87	88
Sablefish	38	72	33	64
Ling cod	83	110	10	11
Halibut (California and Pacific)	178	170	122	108
Others	767	726	336	459
TOTAL	15404	14628	5266	5379

*Principal species group defined as that group which accounts for more exvessel revenue than any other species group.

Table 2. Inter-state activity for 1982: Number of vessels landing in each state and combination of states.

State(s) of landing	All gear	Trawlers	Trollers* Salmon	Albacore
Washington only	4661	166	2127	11
Oregon only	2938	144	2338	17
California only	5850	204	2937	139
Washington and Oregon only	425	70	265	5
Washington and California only	105	12	10	10
Oregon and California only	526	71	316	19
All three states	123	18	84	9
TOTALS	14628	685	8077	210

*Vessels assigned to two classes of troller based upon plurality of revenue in 1982. If vessel used troll during the year and most of the vessel's revenue came from coho or chinook salmon, the vessel is called a salmon troller. If it used troll and the greatest amount of revenue was from albacore, the vessel is an albacore troller.

Contract Report on "Marine Recreational Fishery Economics-Pacific Coast" Accepted

Dr. Daniel Huppert and Cynthia Thomson, Economists at La Jolla, accepted the final contract report from Energy and Resource Consultants, Inc. of Boulder, Colorado. The report accomplishes several objectives: 1) investigates the usefulness of the Marine Recreational Fishery Statistics Survey for estimating economic values of recreational fishing on the Pacific Coast, 2) applies two versions of the popular travel-cost demand models to produce estimates of gross and net economic values, and 3) describes ERCO's design and pretest of a survey instrument for use in the San Francisco Bay area. As defined for this study, the "net economic value" corresponds to the amount anglers would be willing to pay over and above current expenditures to maintain existing marine recreational fishing opportunities. "Gross economic value" equals the net value plus current expenditures associated with recreation. The reported values are broken down by mode fishing (beach and bank, man-made structures, private boat and party/charter boat) and by State.

Drs. Robert Rowe of ERCO and Ed Morey of University of Colorado were principal investigators on the project. They developed an innovative and theoretically rigorous model of recreational choice using travel cost as a pseudo-price variable and aggregated fishing sites (characterized by mode, county and average catch rate) as objects of choice. From this perspective

the "value" of having, private boat fishing in San Diego county, for example, is the amount which anglers would be willing to pay to avoid losing that option. Clearly, loss of any mode of fishing in any county entails two major effects on anglers. First, anglers may incur larger expenses in seeking substitute angling opportunities at other sites or in different fishing modes; and, second, the shift from first-choice mode/site causes an economic loss in value to the angler. Both these effects are incorporated in estimated willingness to pay. Aggregate Net and Gross Value of Pacific Coast Marine Recreational Fishing in 1981 in thousands of dollars are as follows:

Table

State of fishing site	Value of all fishing trips in all modes	
	Net economic value	Gross economic value
	----------$1,000----------	
California	$690,253	993,900
Oregon	$ 59,351	107,332
Washington	$ 90,177	145,515
TOTAL	$839,781	1,249,747

(C. Thomson, FTS 893-6209)

Research Continues on Economics of Pacific Groundfish Fleet

Dr. Dale Squires, Industry Economist, is currently conducting on-going research on the economics of the Pacific groundfish fleet. The study will provide a summary of the costs, revenues, and operating characteristics of the fleet and will examine the economics of a potential limited entry program. The study will provide the number of cost-minimizing vessels in the fleet and information on the relationships between different inputs in the harvesting process. Daniel Huppert, Economist, is coordinating the study, and Chuck Korson and Wes Silverthorne, SWR, Terminal Island, Ed Ueber, SWFC Tiburon Laboratory, Joe Terry and Rich Marasco, NWFC, Seattle, and Sue Hanna, Dept. of Agricultural Economics, Oregon State University, are also participating. In the study, two different approaches to model the economic activity, linear programming, and econometric estimation of costs are used.

Squires is currently concentrating on support activities for this project. These activities include compilation of mean annual incomes for four different occupational categories in every coastal county of Washington, Oregon, and California for 1977-1982. He is also summarizing and reviewing past fishery budget simulators. These simulators examine the net returns and costs of fishing vessels under different market and management conditions. He is reviewing the simulators from the perspective of the theory of the firm, and he is considering the compatibility between

the cost analysis supporting the economic analysis of the Pacific groundfish fleet and the budget simulator approach. (D. Squires, FTS 893-6209)

Issues Reviewed in Southern California Groundfish Fisheries

Groundfish issues and research needs are relatively well defined for fisheries north of Pt. Conception, partially as the result of the attention generated by the West Coast Groundfish Fishery Management Plan. In contrast, southern California groundfish issues have not received as much attention. In an effort to improve knowledge and awareness of current monitoring and research activities, issues and problems, Drs. Alec MacCall and Daniel Huppert recently undertook an informal survey.

While there is certainly no lack of issues or problems in the southern California groundfish fisheries, the issues seem to lack the clear definition seen in the northern fisheries. The problem extends even to defining what a "groundfish" is, as the variety of species and gears is much more diverse than in the north. The size of the southern California harvest is surprisingly large in some cases: for example, one quarter to one third of the statewide landings of rockfishes is taken south of Pt. Conception. More significant is the relative intensity of the recreational fishery, which accounts for about one-half of the southern California catch of groundfish. Accordingly, one of the most heated issues is recreational fishermen's antipathy for the gill nets used by the commercial fishery. Commercial gill net activity has increased in recent years, with new entrants as well as conversion by many former longline fishermen. The California Department of Fish and Game is in the process of augmenting its monitoring of southern California groundfish fisheries by means of extensive landings sampling, logbooks and on-board observers. (A. MacCall or D. Huppert, FTS 893-6820)

Funds Allotted for Biostatistical Study of Southern California Contaminants

The Ocean Assessments Division (Seattle Office) of NOAA's National Ocean Service has transferred funds to begin a two-year study of the effects of contaminants on productivity of pelagic fishes in southern California waters. The study initially will attempt to account for changes in abundance due to fishing and natural environmental effects, and subsequently will examine relationships to contaminant inputs in southern California waters. The study also will include an outside contract to compile time series of contaminant inputs to the southern California Bight. The agreement to undertake the study was made with full awareness of the difficulty of detecting the effects of contaminants statistically in very "noisy" and imperfectly understood fish populations. While the main goal of the study is to test the null hypothesis, "There has been no effect of contaminants on the productivity of pelagic fishes in southern California," a parallel goal will be to assess the ability to detect such effects if, in fact, they are present (i.e. to determine the power of the statistical tests). (A. MacCall, FTS 893-6221)

SWFC Towed Sonar Tested

Drs. Richard Methot and Paul Smith conducted a successful first test of the towed sonar, newly acquired by the SWFC, on the David Starr Jordan during April 4-6, 1985.

The towed sonar was purchased to fill a need for acoustic surveys of the distribution of pelagic fishes. There are two immediate uses for this sort of information. First, the towed sonar will permit mapping of schooled fish concentrations and thus enable an adaptive stratified random trawl allocation scheme to be made. Second, visual surveys of major predators (marine mammals and birds) will permit collection of more ecological data through use of the towed sonar which can simultaneously record the distribution of potential prey. A third use is acoustic estimation of pelagic fish biomass, although that possibility is not presently being pursued.

The SWFC's towed sonar was designed to take full advantage of the Jordan echo sounder, the Simrad EK400. The towed body houses a 38 and a 120 kHz transducer directed to the port side of the body. The EK400 currently has one transceiver operating at 38 kHz and is capable of operating a second transceiver at 120 kHz, but this higher frequency transceiver has not yet been obtained by National Ocean Service. The lower frequency is suitable for schooled fish such as anchovy and the higher frequency will be suitable for loosely packed swarms of juvenile fish, squid or euphausiids.

According to Methot and Smith, the towing characteristics of the towed sonar exceeded expectations. They towed the unit from the stern A-frame at a speed of 9 knots. The tow cable tended aft only about 10 degrees from the vertical and there was little vibration of the cable; the towed body does not interfere with turning of the ship or with stopping on station.

Probable fish schools were detected at ranges up to 500 m. with the 38 kHz transceiver/transducer. Ranges greater than 500 m were not displayed but it is likely that schools could be detected at greater range in good conditions. The effective range of a side-looking sonar is restricted in shallow water because the spreading acoustic beam intersects the sea floor. Bottom return became noticeable at a depth of about 40 fathoms but fish schools could be detected above this noise at bottom depths of about 30 fathoms. At depths of about 20 fathoms the noise level became so great that useful data could not be obtained. The higher frequency system may perform better over shallow depths. (R. Methot, FTS 893-6225)

OCEANIC FISHERIES RESOURCES DIVISION
La Jolla, California

TUNA ASSESSMENT INVESTIGATIONS

Studies Completed for International Skipjack Year Project

David Au, Fishery Biologist, completed final editing of two papers originally presented at the International Skipjack Year Conference at Tenerife, Spain. The first, co-authored with Dr. Stephen Goldberg of Whittier College, and entitled "The spawning of skipjack tuna from southeastern Brazil as determined from histological examination of ovaries," presents evidence of summer (southern hemisphere) spawning in southeastern Brazilian waters. Au and Goldberg found histologically mature ovaries, as well as high gonad index values, between November and March. The smallest mature skipjack in their sample was 510 mm. The second paper, "Skipjack population dynamics-is it qualitatively different from that of other tropical tunas?", is a review of population parameters of tropical tunas. As noted by other authors, the extensive movements and possibly large fluctuations in natural mortality could explain the major features of the dynamics of skipjack. Au further suggested that natural mortality might be density-dependent, as a consequence of this tuna's foraging strategy. (D. Au, FTS 893-6339)

Relationships Among Seabirds, Tuna and Dolphins Studied

On a related subject, David Au and Robert Pitman, Biologist, revised a manuscript discussing relationships among seabird species, tuna, and dolphins in the eastern tropical Pacific. Data for this study were collected between 1976 and 1980 on porpoise surveys. Au and Pitman point out that there are two main types of species interactions: (1) multispecies flocks, dominated by boobies, in association with yellowfin tuna and spotted dolphins, and (2) monospecific flocks of sooty terns with skipjack. The former is characteristic of the "porpoise-tuna" fishing grounds; the latter is characteristic of the southeastern tropical/subtropical Pacific and central Pacific. (D. Au, FTS 893-6339)

Swordfish Reproduction Potential in California Waters Studied

A manuscript entitled, "The sex ratio and gonad indices of swordfish (Xiphias gladius) caught off the coast of California in 1978," has been accepted by the U.S. Fishery Bulletin. The manuscript, by fishery biologists Earl Weber and Dr. Stephen Goldberg, Whittier College, describes the reproductive potential of swordfish during their yearly migrations into California waters. Each year during the summer and autumn months, swordfish migrate into the Southern California Bight, an area extending

from Point Conception to the Mexican border. In 1978 scientists from the Southwest Fisheries Center collected gonads from swordfish harpooned in the Bight in order to determine their sex ratio, gonad indices and reproductive potential.

Ninety swordfish were sampled from August 28 through November 20, 1978. All were mature and the sex ratio for the period was found to be 0.34:1 (M:F). Gonad indices, calculated for all females, were far below those for ripe and running females reported in other studies concerning the maturity of Pacific swordfish. Low values indicate the swordfish in the Bight during the sampling period were not spawning. This conclusion was supported by results of a histological analysis performed on a subset of 16 pairs of ovaries from the sample. These ovaries contained no mature oocytes or abundant atretic oocytes indicative of the resorption process. The analysis indicates the swordfish were reproductively inactive during the sampling period and for at least a month or two before capture.

Although these results do not preclude the possibility of spawning early in the year, swordfish then are more scarce. Also, water temperatures favorable for spawning, not widespread in the summer and autumn, are almost nonexistent the remainder of the year. (E. Weber, FTS 893-6214)

1983 Billfish Angler Survey Results Available

James Squire, Fishery Biologist, reports that the Annual Billfish Newsletter with the results of the 1983 Pacific Billfish Angler Survey was completed this month and is being distributed to those on an established mailing list.

The purpose of the Pacific Billfish Angler Survey is to analyze the trend in billfish catch per angler day for various locations throughout the Pacific. The information derived from this survey is summarized by geographical areas and species caught, and is available upon request to Squire to anyone interested in this.

In 1983 the total number of billfish angler days reported in the Pacific and Indo-Pacific Ocean was 9,138; the total number of billfish reported caught was 4,069. The 1983 Billfish Angler Survey for the Pacific Ocean showed a decrease from 1982 of 831 angler days. The numbers of billfish reported decreased from 1982 by 1,089. The Pacific-wide billfish catch rate for 1983 was 0.45 billfish per angler day, or 2.25 days per billfish. The catch rate was down from the 1982 results (0.51 fish/day or 1.96 days/fish).

The 1983 catch rate for striped marlin caught off Baja California was 0.47 fish per day, a decrease from the 1982 rate. Blue marlin were very common in the fishery in 1983. The blue marlin catch rate was 0.18 fish per day based on 2,797 anglers reporting a catch of 500 blue marlin. Southern California catch rate for striped marlin (0.18 fish/day)increased from the 1982 rate.

Sailfish catch rates continued to be about 0.8 to 0.9 fish per day for Acapulco. Other important sailfish fishing areas such as Panama recorded 0.5 fish per day, down sharply from 1.1 fish per day recorded in 1982, and Costa Rica recorded 1.3 fish per day, up slightly from 1982.

The CPUE in 1983 for black marlin off Queensland, Australia was similar to the trend of CPUE observed since 1978--about 0.5 fish per angler day (5.5 in 1983).

The blue marlin CPUE for Hawaii reflects a slight increase to 0.19 fish per day in 1983. Catch rates of about 0.2 fish per day have been common since 1977 and the surveys since 1980 have shown slight increases in CPUE. (J. Squire, FTS 893-6376)

MARINE MAMMAL ASSESSMENT INVESTIGATIONS

Pinniped Tag and Tag Resight Data Base Created

An objective of the Coastal Marine Mammal Program is to assess the population status of marine mammal species which are affected by human activities. To assess these populations, information on range distributions, temporal and spatial movements and life history parameters (i.e. survivorship, age at first reproduction, fecundity rates) is needed. Data collected from mark/recapture methods involving tagging and tag-resight observations were used in estimating this information.

Recent tagging studies on pinnipeds in California began in 1975 at San Miguel Island by NMFS biologists. Additional tagging studies began in 1981 at other Channel Islands and areas within California. These studies have been conducted by Southwest Fisheries Center (SWFC) scientists, the U.S. Fish and Wildlife Service, the California Department of Fish and Game and other public or private organizations including Hubbs Research Institute, the Point Reyes Bird Observatory, the University of California at Santa Cruz, Moss Landing Laboratory and marine mammal rehabilitation centers. Tagged animals are resighted and data on the animals are collected by these organizations. Tag resight information is also provided by members of the general public.

Tagging and resighting are coordinated by the Southwest Region and the Southwest Fisheries Center. Data are archived at the Region and SWFC. A data base was created by biologist Chuck Oliver at the SWFC in 1981 to provide a centralized source for pinniped tag/resight data archived by the SWFC. Jeanne Wexler, Biological Technician, entered the data, and edited and maintained the data base. The data base contains tagging and tag resight information for four species of pinnipeds: California sea lions (*Zalophus californianus*); northern elephant seals (*Mirounga angustirostris*); harbor seals (*Phoca vitulina*); and northern fur seals (*Callorhinus ursinus*). To date, 15,897 records of tagged and resighted pinnipeds are listed (Table 1). These include 1,558 tagged and 171 pinnipeds resighted in 1985.

Table 1. Total tags and resights, by species, for the period 1975-1985.

Species	1975-1984 Tags	1975-1984 Resights	1985 Tags	1985 Resights
Zalophus californianus	3,798	5,098	0	130
Mirounga angustirostris	5,873	179	1,558	47
Phoca vitulina	31	9	0	0
Callorhinus ursinus	1	3	0	0
TOTALS	9, 703	5,289	1,558	177

(J. Wexler, FTS 893-6345)

ECOLOGICAL FISHERY SYSTEMS INVESTIGATIONS

Spatial/Temporal Patterns in Distribution of Dolphins Studied

Preliminary work on patterns of dolphin distribution was recently completed by Dr. Steve Reilly, Operations Research Analyst at La Jolla. The work is part of a larger project initiated about 2 years ago to investigate large-scale patterns of cetacean distribution in the eastern tropical Pacific (ETP), and quantifiable relationships with the marine environment.

The analysis at present concentrates on the four target species: spotted, spinner, common and striped dolphins. The other cetaceans (and the necessity for complex multivariate statistics) will be studied later. The variables examined here are encounter rates with schools of dolphins of the four target species, as reported by scientific observers aboard tuna purse seiners during the years 1975 -1983. Data recorded during poor sea states (Beaufort 5 and higher) were excluded. Two-degree geographic squares were the case units, with only those squares having at least 100 n.mi. searching included (after partitioning the data according to experimental factors, as described below). School sizes for spotted dolphins were also examined.

For these preliminary tests, the data have been factored along lines relevant to planned comparisons with oceanographic variables. Factors examined to date include geographic areas (the eastern tropical Pacific was divided into four large sub-areas, based on thermocline topography and current structure), seasons (calendar quarters) and inter-annual periods (whether or not an El Niño event was occurring). Because areas and inter-annual periods were defined from environmental considerations, they provide indirect tests of the association of encounter rates with these environmental features.

Spotted and spinner dolphins had higher encounter rates (schools sighted per mile searched) in the areas between 20° and 2°N, striped in the area south of 2°N and common north of 20°N (Figure 1). Spotted, spinner and common had significant seasonal differences in encounter rates (Figure 1), but these were complicated by season-area and season-period interactions, and are thus difficult to interpret. Mean encounter rates were not different between periods (Figure 2), but the distributions producing the similar means were quite different (Figures 3 and 4). During an El Niño (as represented by the 1976-77 and 1982-events) the distributions were significantly more "coarse grained", i.e. schools were sighted in far fewer 2-degree geographic squares, but were more abundant in those squares where seen, as represented by the fewer but darker shaded areas in Figure 4 as compared to Figure 3. Differences in grain have not yet been investigated comprehensively for seasonal and aerial effects, but Table 1 suggests that these may be important sources of variability in encounter rates.

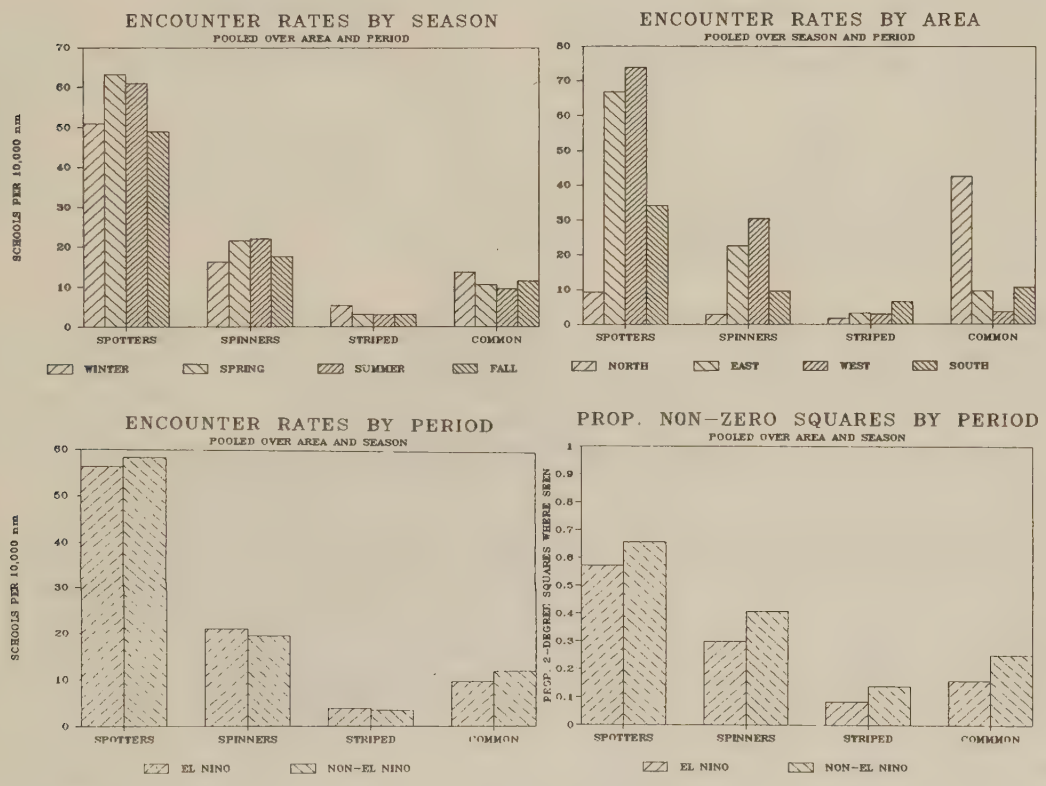

Figure 1. Left: Seasonal encounter rates for spotted, spinner, common and striped dolphin schools, pooled over area and period. Right: as above, but by area pooled over season and period. Figure 2. Left: El Niño vs non-El Niño encounter rates for schools of spotted, spinner, common and striped dolphins, pooled over area and season. Right: proportions of 2-degree geographic squares searched with dolphins present, for spotted, spinner, common and striped dolphins, pooled over area and season.

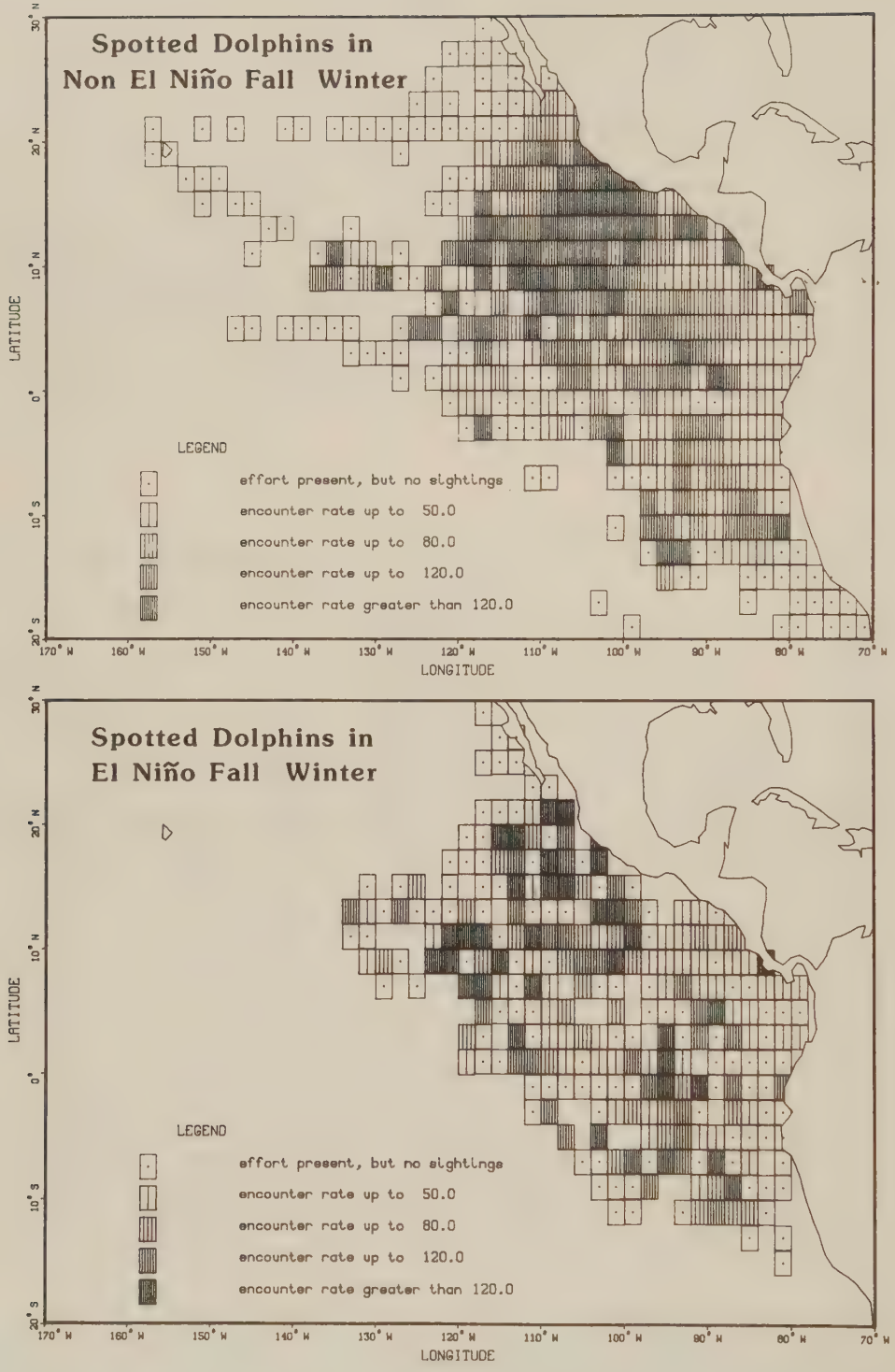

Figure 3. Top: Non-El Niño (Oct-Mar) geographic distribution of spotted dolphin encounter rates. Figure 4. Bottom: El Niño (Oct-Mar) geographic distribution of spotted dolphin encounter rates.

Table 1. Proportions of 2-degree squares with search effort and sightings, by species, area, season and interannual period. Seasons are for northern hemisphere, areas are defined in Figure 1, and periods are defined in text.

Factors	Dolphin species Spotted	Spinner	Striped	Common
El Niño years	.57	.30	.08	.16
Non-El Niño years	.66	.41	.14	.25
Winter	.61	.37	.17	.30
Spring	.66	.38	.11	.21
Summer	.66	.42	.11	.17
Fall	.53	.28	.09	.20
North	.17	.07	.08	.54
East	.71	.43	.13	.23
West	.75	.50	.09	.10
South	.43	.19	.12	.18
Species means	.63	.37	.12	.22

Like encounter rates, school sizes for spotted dolphins were not significantly different between periods, on average, but there were differences between the within-period distributions. Most notably, very large average school sizes were observed during the El Niños south of 2°N and west of 120°W (along the 10°N thermocline ridge).

These results are tentative, however, because some of the analysis of variance assumptions were violated because of missing data in some cells. These problems necessitated testing a variety of slightly different models, with different data transformations, methods of computing sums of squares, etc. Results from these alternate models have in some cases been conflicting or inconsistent. Reilly has settled on a "preponderance of evidence" approach in suggesting tentative conclusions from these tests.

In summary, analyses by Reilly completed to date suggest that there are pronounced changes in dolphin school density and school size by season and sub-area within the ETP. Further, there appear to be interesting differences between El Niño and non-El Niño periods in the distributions of encounter rates and school sizes. However, these patterns are complex, and may be complicated further by changes in tuna vessel fishing patterns and searching strategy. Ongoing research by Reilly, Dr. Tim Smith and Paul Robertson of the Ecological and Fishery Systems Investigations is aiming to unravel these complexities. (S. Reilly, FTS 893-6385)

BIOLOGICAL SYSTEMS INVESTIGATIONS

Genetic Map of Dolphin mtDNA Completed

Information on the mtDNA genome is necessary to direct future restriction fragment length polymorphisms analyses to the portions of the molecule which are highly variable and to ignore highly conservative regions that are the same not only between stocks but between orders. To do this, Dr. Sarka Lucas, Marine Mammal Commission, has completed restriction mapping of mitochondrial DNA (mtDNA), which had been purified by Dr. John Graves, of the common dolphin (Delphinus delphis) and Commerson's dolphin (Cephalorhynchus commersonii). The genetic arrangement (presence and arrangement of genes) of the dolphin mtDNA, appears to be similar to that reported for other vertebrates. In addition, Dr. Lucas has determined the nucleotide sequence of several segments of the highly variable D-loop region of C. commersonii mtDNA. Her results indicate that the D-loop contains several regions which are similar to the sequences of other vertebrates interspersed with sections of no apparent sequence homology. It is in the latter regions where one would expect the greatest sequence divergences between individuals (no functional genes) and where future analyses could be targeted. (A. Dizon, FTS 893-6213)

Tooth Preparation and Age Estimates Completed for 2600 Female Spinner Dolphins

Priscilla Sloan, Fishery Biologist, and Dr. Al Myrick, Leader, Marine Mammal Age Determination Project, recently completed readings of samples of 2600 specimens of teeth representing the entire available sample of female spinner dolphins processed from the eastern tropical Pacific tuna purse seine fishery from 1973 through 1982. The completion of tooth readings marks the successful end of the second phase of the effort to analyze growth rates, age structure, sexual maturity, and age-specific reproduction rates in the northern and southern whitebelly spinner and eastern spinner dolphins (Stenella longirostris). The first phase of the activity began approximately 2 years ago with the selection and laboratory preparation of the initial batches of teeth by Priscilla Sloan and technicians Laurie Patla, Lou Arnell, Drew Stanley, and (now retired) Fishery Biologist Makoto Kimura. Preparation of the gargantuan tooth sample was achieved through the efforts of Patla, Cathy Dargan, and Larry Wykoff. (A. Myrick, FTS 893-6335)

Correlations Between Location of Pelagic Animals and Geomagnetic Features Sought

Dr. Michael Walker, National Research Council Post-Doctoral Fellow, reports that his investigation of associations of marine animal sightings from the CETAP database (a large-scale biological survey of the Atlantic continental shelf) with bathymetric and magnetic data revealed large-scale associations of sighting positions with depth and small-scale associations of sightings with areas of low magnetic field intensity. The results permit assignment of species to major bathymetric habitats as, for example,

fin whales and turtles to continental shelf and pilot whales to continental slope areas. Within these zones there is no clear pattern of association of sightings with depth. Although the animals are usually widely dispersed within these major habitats, there is a significant tendency for animals to be sighted where magnetic field intensity is low relative to surrounding areas.

A newly developed measure of magnetic field tilt has permitted investigation of the relationship of sightings from the CETAP data set to gradients in magnetic field intensity over the continental shelf and slope of the northeastern U.S. The measure comprises the sum of the absolute differences between the magnetic field intensity at any point and the intensities at eight adjacent points. Comparison of the mean tilt at points where animals were sighted with the mean values for the whole area sampled show a significant tendency for the animals to occur in areas where magnetic field intensity gradients were low. Although the tilt measure is not normally distributed, this finding was substantiated by Monte Carlo simulations which generated sets of position randomly distributed along the flight lines flown by CETAP surveys. Comparison of the mean tilt values for the randomly placed and actually observed positions demonstrated that the associations of whales with areas of low magnetic field intensity gradients could not have occurred by chance. The associations of sighting positions with areas of both low magnetic field intensity and intensity gradients imply that the animals occur more frequently near the bottom of "magnetic valleys" than elsewhere. Reprogramming is recently under way to test whether similar associations with "bathymetric valleys," such as the submarine canyons intersecting the continental slope, can be demonstrated. (M. Walker, FTS 893-6213)

Simple Energetics Hypotheses May Explain the Tuna-Dolphin Association

Yellowfin tuna and spotted dolphin occur together in mixed schools in the eastern tropical Pacific Ocean. This type of association occurs almost nowhere else in the world. The shallow thermocline in the area probably forces both groups of animals into the first 50 to 100 m of the water column, but no quantitative hypotheses have existed to explain why the association started or why it persists. Dr. Elizabeth Vetter, Operations Research Analyst, recently completed a set of comparative bioenergetic models for these two groups and found during her study that the origin of the association could be explained on the basis of optimal sustained cruising speed for each species. Persistence of the association could be explained on the basis of feeding dynamics.

Optimum sustained cruising speed (the speed at which maximum distance is covered at minimum energy cost) is the same for tuna and dolphin of the same length because they are roughly the same shape. Age III tuna, the size most frequently caught with dolphin, are the same size as first-year dolphin (about 85-130 cm); optimal swimming speed for these animals is about 120 cm per sec. Tracks of radio-tagged spotted dolphin show that the average speed of undisturbed schooling dolphins is also about 120 cm per sec. Thus, tuna and dolphin traveling the same direction may have begun associating simply because they happened to be traveling the same speed. Both radio-tracking data and size composition of tuna schools caught with

and without dolphin (tuna without dolphin are smaller) support this hypothesis.

Although the association could have arisen fortuitously on the basis of cruising speed, energetics models predict that persisting in the association could be a problem for tuna. Estimated forage requirements for dolphin are 5 to 15 times greater than requirements for tuna; thus tuna are associating with an especially voracious competitor. But tuna are much smaller than dolphins and have correspondingly smaller stomachs. A single tuna has a stomach capacity of about 1/2 kg; stomach capacity of an adult spotted dolphin is about 4 kg. If feeding preferences and behaviors are the same for both tuna and dolphin, then stomach capacity is the major difference between these two predators. Given equal probability of successfully capturing an item of prey, tuna will have full stomachs earlier than dolphin. Thus tuna will complete their feeding bout while food is still relatively dense; dolphin will have to continue feeding on prey that are more dilute.

Researchers studying dolphin acoustics suggest that the animals may have superior ability to locate prey. If so, age III tuna would benefit from associating with dolphin by encountering prey more often, at no added energetic cost. The persistence hypothesis is supported by the observation that stomach contents of tuna and dolphin caught simultaneously are similar. Direct observation of feeding behavior in the field has not been possible, but the similar morphology and food preferences of each group implies that feeding strategies are quite similar. (E. Vetter, FTS 893-6285)

SENIOR SCIENTIST UNIT

Workshop Planned on River Dolphins

Senior Scientist William F. Perrin and Dr.Robert L. Brownell of the U.S. Fish and Wildlife Service are organizing a workshop meeting on the biology and conservation of the river dolphins. The workshop will be convened under the auspices of the Species Survival Commission (SSC) of the International Union for the Conservation of Nature and Natural Resources (IUCN) probably in spring or fall of 1986 in Wuhan, People's Republic of China.

Several of the seven species of dolphins that primarily inhabit rivers and estuarine areas are in danger of extinction. These include the beiji (*Lipotes vexillifer*) in the Yangtse River (possibly down to as few as 400 individuals), the Indus susu (*Platanista minor*) in Pakistan and the Ganges susu (*P. gangetica*) in India and Bangladesh. Others face danger from habitat encroachment and incidental mortality in fisheries; these include the franciscana (*Pontoria blainvillei*) in Uruguay, the boutu (*Inia geoffrensis*) and the tucuxi (*Sotalia fluviatilis*) in Brazil, the pesut (*Orcaella brevirostris*) in Indonesia and the finless porpoise (*Neophocaena phocaenoides*) in the Yangtse.

The meeting will be hosted by the Institute of Hydrobiology of the Chinese Academy. The Institute is presently carrying out research on the beiji and the finless porpoise, including an attempt to breed beiji in captivity.

Sessions of the one-week workshop will focus on stock assessment, habitat condition and preservation, life history, husbandry, and conservation. The goal will be to develop a set of research recommendations. A tentative list of participants includes specialists from China, Bangladesh, Pakistan, India, Nepal, Brazil, Japan, Uruguay, the Netherlands, USA, UK, and Argentina. Some support for the meeting has been offered by the New York Zoological Society; further funding is being sought. Perrin will discuss plans for the meeting with scientists in Wuhan during a visit there in October 1985. (W. Perrin, FTS 893-6267)

MULTISPECIES DATA MANAGEMENT AND FISHERIES MONITORING PROGRAM

1984 Tuna/Dolphin Data Bases Completed

Data collected on all eleven observed 1984 NMFS tuna/dolphin cruises have been edited by biological technician Randy Rasmussen and put onto the data base. These data, collected by biological technicians placed aboard commercial tuna seiners fishing in the eastern tropical Pacific, describe cetacean sightings and sighting effort, vessel fishing effort and gear deployment, and incidental cetacean mortality from the tuna fishery.

Biological technician Al Jackson reports that a summary of the 1984 tuna/dolphin data shows the eleven cruises included 640 days at sea during which the technicians logged 2,935 hours of cetacean watch effort. A total of 1,429 cetacean sightings were recorded, including 599 sightings that contained one or more of the species that have been affected by the fishery. The seiners set their nets a total of 426 times; 388 of these sets involved cetaceans. A total of 9,077 tons of yellowfin tuna, 812 tons of skipjack tuna and 26 tons of bigeye tuna were loaded aboard vessels that have a combined fish capacity of 11,578 tons. The technicians counted 2,999 individual cetaceans killed in the seiner's nets. This kill is composed of 1,255 Stenella attenuata, 1,001 Stenella longirostris and 743 Delphinus delphis. The resulting cetacean kill per set is 7.73 and kill per ton of tuna loaded is 0.34. A more detailed summary of these data will be provided in a forthcoming Administrative Report. (A. Jackson, FTS 893-6362)

PACIFIC ENVIRONMENTAL GROUP
Monterey, California

Operational Plan for NMFS Albacore Fishery Program Completed

The North Pacific Albacore Fishery Research and Management program was selected by the Directors of the Southwest Fisheries Center and the Southwest Region as the subject of an intensive review and expanded planning effort after the NMFS Tuna Research Workshop held at San Clemente, California in December 1980. Planning for an expanded albacore program has proceeded in several steps. The first phase was completed in June 1983, when members of the U.S. albacore industry and other invited constituents participated in a workshop at the Southwest Fisheries Center to set forth their desirable goals and objectives for the fishery. The second phase of the planning effort, strategic planning, involved NMFS management determining what NMFS could do to meet those objectives. An Administrative Report (LJ-84-09), "The Strategic Plan for the National Marine Fisheries Service's North Pacific Albacore fishery Program" summarizes the NMFS strategic plan that was developed by the NMFS management.

The third planning phase focused on developing operational plans and budgets for the various sectors of the research and management program. A report of the planning effort prepared by Dr. Richard Parrish of the Center's Pacific Environmental Group at Monterey, assisted by staff from the Southwest Region and Center, has been completed and will shortly be issued as a Technical Memorandum of the Southwest Fisheries Center.

As developed, the operational plan will focus NMFS work into three areas: assessment of the albacore stocks in the North Pacific, development of information for fisheries advisories, and development of markets for the domestic albacore catch.

Work in the first area consists of population dynamics research which includes fishery statistics, fishery sampling, the albacore log book program, aging albacore, tag and recapture studies, fishing and natural mortality estimation, stock assessment, estimation of recruitment and various modeling activities. The principal goals of this work are to assess the size and productivity of the albacore stocks in the North Pacific.

The second area involves work leading toward an understanding of albacore behavior, particularly as it applies to their availability and susceptibility to capture. Planned research includes tagging and tracking studies, exploratory fishing, laboratory and field studies of the physiology of albacore, analysis of catch rates in relation to environmental features and the development of methods to forecast the catch or catchability of albacore. The principal goal of this work is to improve the efficiency and profitability of the harvesting sector to help keep the domestic fishery competitive with foreign fleets.

The third area involves work leading towards development of onboard preservation methods, enhancing product quality, development of new products, marketing studies, and economic evaluations of both the harvesting and processing sectors of the industry. The primary goals of this work are to improve the technology for maintaining the quality of fresh and frozen albacore and to develop alternative albacore products and markets.

The Albacore Operational Plan also included elements which were contributed by the staffs of the Southwest Fisheries Center's Oceanic Fisheries Resources Division, Coastal Fisheries Resources Division, Honolulu Laboratory, the Pacific Environmental Group, and the NMFS Southwest Region. Other inputs to the plan came from industry groups concerned with the North Pacific albacore resources, other NMFS organizational units, and ideas and proposals contained in Saltonstall-Kennedy Grant proposals on albacore.
(R. Parrish (408) 646-3311)

TIBURON LABORATORY
Tiburon, California

GROUNDFISH ANALYSIS INVESTIGATION

Problems Continue in Sampling Recreational Groundfish Landings

Recreational groundfish fisheries of central and northern California have been sampled since 1977 through a cooperative survey effort between the California Department of Fish and Game and the NMFS. Difficulties continue in obtaining adequate samples sufficient to encompass the commercial passenger fishing vessel fleet and the weighting factors required to extend the sample data to the total catch. The value of the program is further limited because skiff and pier fisheries are not included in the sampling base.

The Magnuson Fishery Conservation and Management Act mandates the preparation of fishery management plans and requires that the plans include recreational as well as commercial fisheries. Candis Cooperrider, Fishery Biologist on the Groundfish Analysis Investigation, and Norman Abramson, Director of the Tiburon Laboratory, are studying ways in which the present recreational sampling program can be enhanced.

Since 1979 the NMFS has supported the Marine Recreational Fishery Statistics Survey for the Pacific Coast which is designed to sample a variety of recreational fishery methods using intercept (field) surveys and telephone interviews. Data from this program were first published in 1984. Cooperrider is currently investigating the feasibility of combining the current NMFS-California Fish and Game Cooperative Groundfish Survey with the Marine Recreational Fishery Statistics Survey. The management goals of the Cooperative Survey require sex and age data of fish which are currently not collected by the Statistical Survey. However, the Statistical Survey does sample all modes of the recreational groundfish fishery and, because of the intensity of sampling effort, provides adequate values to expand the sample data. Possibly the two programs will be integrated to provide the data needed for sound management of groundfish. (C. Cooperrider (415) 556-0565)

First GAM Meeting Termed a Success

The first Groundfish Alternative Management (GAM) meeting was held jointly with the economists' Working Group at San Francisco State University on March 28 and 29. The GAM, coordinated and chaired by Edward Ueber, Economist with the Groundfish Analysis Investigation of the Tiburon Laboratory, is composed of fishermen, processors, and members of state management agencies. It was organized to advise the Working Group on developing and evaluating alternative methods of managing Pacific Coast fisheries for groundfish.

On the first day, the two groups discussed the current state of the groundfish industry and various methods used to manage fisheries around the world. Since the groundfish fleet is under constraints to maintain landings at optimum yield levels, much of the discussion centered on the difficulties vessel owners have had in meeting expenses, and the positive and negative aspects experienced in limited-entry form of fishery management throughout the world.

On the second day, the two groups discussed work plans for the remainder of the year. The Working Group will prepare a fleet profile and research proposals to address the complex problems faced by the industry. After review by the GAM, the Working Group will submit revised proposals to the appropriate agencies.

If this first meeting is any indication, the open and frank dialogue between the two groups should prove very useful toward the objective of developing better methods for managing the West Coast groundfish fishery. (E. Ueber (415) 556-0565)

Relationship between Otolith Size and Fish Length Studied

Tina Wyllie Echeverria, Carol Reilly, Sharon Moreland, and David Woodbury, members of the Groundfish Analysis Investigation at the Tiburon Laboratory, have been investigating the relationship between otolith length and fish length in the rockfishes (genus Sebastes). In general, otolith size increases with the size of a fish, at least until the fish reaches maximum size. This relationship can be useful in estimating the size of a fish, given only the otolith, or in some cases, in identifying a species, given the otolith size and ring pattern. In order to investigate the linear relationship between otolith length and fish length, measurements were taken of 34 species of rockfishes. Correlation coefficients were high, ranging from 0.91 to 0.98, for all species. Regressions were also run on the sexes separately. Species known to have a differential growth rate by sex showed a significantly different otolith length-total length relationship between sexes; these species include widow rockfish, yellowtail rockfish, bocaccio and chilipepper. Species that are known to have the same growth rate for both sexes did not differ significantly; these species include brown, gopher, copper and China rockfish. (T. Echeverria (415) 556-0565)

PHYSIOLOGICAL ECOLOGY INVESTIGATION

Staff of the Physiological Ecology Task Begins New Study of Rockfishes

Field collections and laboratory work have begun as part of a new research program on the physiological ecology of rockfishes from off the central California coast. (A general description and overview of the new Task were presented in the January-February Report of Activities.) To assess nutritional and physiological conditions and to determine their

relationships to reproductive capacities, pre-adult and adult rockfish specimens have been collected from cruises of the NOAA Ship David Starr Jordan, partyboats, and commercial fishing vessels. The whole organism and blood and tissue samples are now being analyzed.

As part of the long-term research plans of this program, researchers in the Task are examining the responses of reproducing adults and young-of-the-year juveniles to environmental stresses.

A new collaborative project with the University of California at Davis has begun at the Bodega Marine Laboratory, which will allow Task researchers to conduct experiments in newly constructed wet lab facilities. The aquarium facilities offer the latest in experimental seawater capabilities and provide a full range of marine conditions for research. Initial activities of the Task members include setting up the new site and determining the best methods for collection, transport, and maintenance of experimental specimens. (J. Whipple (415) 556-0565)

UNDERUTILIZED FISHERIES RESOURCES INVESTIGATION

By-Catch of Shrimp Fisheries Find Potential Markets

In southern California spot prawn and ridgeback prawn are caught with small-mesh bottom trawls. Along with the prawns, a number of species of fish that are presently not fully used are also caught. Sus Kato, Chief of the Underutilized Fisheries Resources Investigation, went fishing aboard the commercial trawler Gus-D on March 15 to collect samples of the by-catch which have commercial potential. Some of these were turned over to buyers for evaluations. One restaurant owner felt that box crabs (Lopholithodes), California king crab (Paralithodes californicus), and skates (Raja sp.) had immediate sales potential. Shovelnose guitarfish were also palatable, although there was not much flesh on the fish. Large ocean shrimp (around 45 whole shrimp per pound) were also frozen on-board for trial use in domestic and export markets. Ex-vessel price for ocean shrimp is low for the traditional market--primarily cooked and peeled tails or "cocktail shrimp"--but good quality frozen shrimp can bring substantially higher prices. Small flatfish which are usually discarded were also found to have commercial value as salted and partially dried products.

As a result of these market trials, one Santa Barbara processor has decided to make a concerted effort to collect and sell some of these species. A second firm will process an upgraded ocean shrimp product, if the supply near Santa Barbara is found to be adequate and consistent. (S. Kato (415) 556-0565)

FISH COMMUNITIES INVESTIGATION

Sharp Population Increases Mark Resurgence from El Niño Conditions

According to Dr. Ted Hobson, Leader of the Fish Communities Investigation, many marine species that were reduced to low numbers off the central California coast during the recent El Niño are now increasing. Evidence of the resurgence is widespread. During a research cruise in April led by Pete Adams, unusually large numbers of young-of-the-year juvenile rockfishes, Sebastes spp., and also of the euphausid, Thysanoessa spinifera, were collected. According to fishery biologist Susan Smith, this species of euphausid is a central component of the marine ecosystem since it is the major prey of many commercially important fish species, as well as of many seabirds and marine mammals.

Similar population increases were observed closer to shore on the Mendocino coast by Hobson and fishery biologists Tony Chess and Dan Howard. In areas where they had been sparse since the El Niño, vast swarms of mysids, amphipods, and other small organisms, important prey of the young of most of the commercially important fish species in the area were found. Researchers at Mendocino also found young-of-the-year canary rockfish (Sebastes pinniger) to be more numerous and to have arrived inshore earlier in the season than during any of the previous 10 years. (E. Hobson (415) 556-0565)

FISHERIES INFORMATION SYSTEMS & ADP

Status of the Molecular Super Microcomputer at La Jolla

Because the La Jolla Laboratory's Molecular Super-Microcomputer 32X (SM 32X) system is functioning successfully as a word processing network, all the secretaries are now linked directly to the SM 32X unit. The La Jolla Standard Microcomputer in the secretarial staff sections are used for file back-ups, for editing documents on diskettes created by the scientists who do not have access to the SM 32X system, and for transferring files to and from the SM 32X.

Direct links have been installed by Jack Brown and Rob Bistodeau from the SM 32X system to the Large Conference Room and to the Small Conference Room. This capability was used for word processing during the April meeting of the Scientific Panel and Eggs and Larval Committee. In addition, files can be transferred between the SM 32X systems between the laboratories. Through the communication port on the SM 32X, Rob Bistodeau has retrieved a lengthy manuscript file and a memorandum file from the Honolulu Laboratory's SM 32X system. Since February, he has been retrieving the Honolulu Laboratory's commitment files for input to the Center's Financial Reporting System.

The software packages currently installed on the SM 32X system are: DBASE II, WORDSTAR, ATI for WORDSTAR, CBASIC, MBASIC, SCI-MATE, and SSS FORTRAN. (D. Roll, FTS 893-6250)

Electronic Mail System Activated

The Electronic Mail System on the Scripps Marine Technology Group's VAX mainframe has been activated for the Center's communication with the radio station, WWD. The system is used by the Center's scientific personnel for telex or wire service to international fishery/oceanography offices and by the Laboratory's Marine Operations Officer for daily position reports from the David Starr Jordan when it is at sea. (D. Roll, FTS 893-6250)

Local Area Network to Be Installed

Fred Kellenberger, Jack Brown, Al Coan, Rich Charter and Ben Remington met with University of California, San Diego representatives Jerry Shannon and Jim Madden on April 11, 1985, to discuss the installation of the UCSD Local Area Network (LAN) at the La Jolla Laboratory. The LAN, which consists of a 400 mHz LAN cable, will allow the SWFC to access the San Diego Supercomputer Center and VAX 11/780 at UCSD. With the installation of the LAN, data will be transferred to computer systems at a very high rate. In addition, computer users will have access to computer systems without using the voice telephone system. The LAN has video features which will allow video displays for conferences and meetings. A contract has

been issued to UCSD for the installation of the LAN at the La Jolla Laboratory. (F. Kellenberger, FTS 893-6341)

MISCELLANEOUS

PUBLIC AFFAIRS

La Jolla Laboratory

March 4 - A sixth-grade class from the La Jolla Elementary School visited the Center. Mark Lowry, Hannah Bernard, and Albert Myrick presented talks on marine mammal research.

Dr. Albert Myrick explains ageing techniques in marine mammals.

April 11 - Twelve students who were finalists in the Greater San Diego Science Fair toured the laboratories at the Center. Michael Laurs gave an overview of research activities at the Center, conducted a short question and answer session, and showed a slide presentation about the Center; Gail Theilacker led a tour of the aquarium, marine mammal ageing laboratory, and the larval fish identification laboratory; Albert Myrick demonstrated marine mammal ageing techniques; Hannah Bernard and Priscilla Sloan escorted students to the various laboratories.

15 - Albert Myrick gave a lecture on "Who's who and why (and where) in the cetacean world" to two 12th-grade biology classes at Mt. Carmel High School.

26 - Dan Huppert gave a lecture on fisheries economics to a class at San Diego State University.

HONORS AND AWARDS

Honolulu Laboratory

April 11 - David C. Hamm (Outstanding Federal Executive) and Hazel S. Nishimura (Outstanding Federal Employee) were nominated by the Honolulu Laboratory for the 29th Annual Honolulu Pacific Federal Executive Board awards. They, together with other Federal employees and military personnel, were honored at a luncheon at the Hawaiian Village Hotel.

19 - Research Assistant Jeffrey D. Sampaga was nominated by the Honolulu Laboratory for the Outstanding Handicapped Federal Employee of 1985 award.

La Jolla Laboratory

La Jolla Laboratory employees received awards for length of service.

Center Director Izadore Barrett presented length of service awards to La Jolla Laboratory employees. Receiving awards for 15 years of service were: Roy Allen, Angeles Alvariño, Ronald Dotson, Virginia Hostler, Anthony Majors, and Gary Sakagawa. For 20 years of service: David Au, John Brown, John Hunter, Ruth Miller, Robert Nishimoto, Elaine Sandknop, Paul Smith, and Frances Tonsich. For 25 years of service: Jack Metoyer, Robert Owen, Pedro Paloma, and Lorraine Prescott. For 30 years of service: Larry Eber. John Carr presented Center Director Izadore Barrett with an award for 15 years of service.

Pacific Environmental Group

March 6 - Doug McLain and Paul Sund were presented with 20-year length of service pins by Izadore Barrett.

PRESS RELEASE

Honolulu Laboratory

April 1 - "Research vessel returns from studies of seamount fishery resources."

SEMINARS

Honolulu Laboratory

March 6 - Professor Ryohei Amano, Faculty of Marine Science and Technology, Tokai University, Shimizu, Shizuoka, Japan, spoke on "Present status of the Japanese skipjack tuna distant water fishery."

13 - Dr. Stephen Ralston spoke on "A submarine assessment of bottom fish at Johnston Atoll, or how many pakas are down there?"

27 - Dr. George W. Boehlert spoke on "Fisheries and ecology of the Hancock Seamounts."

April 10 - Dr. Jeffrey J. Polovina spoke on "Fisheries resource assessment investigation of the Mariana Archipelago."

La Jolla Laboratory

March 5 - Dr. Peter Munk, Charlottenlund Fisheries Laboratory, Charlottenlund Castle, Denmark, lectured on "Current research at the Danish Institute of Fisheries and the North Sea Centre."

19 - Professor Sam Bledsoe, Center for Quantitative Science, School of Fisheries, University of Washington, Seattle, Washington, gave a talk, "Implications of chaos in the dynamics of a bio-energetic food web model."

20 - Dr. Phillip Meyer, Meyer Resources, Inc., Davis, California, discussed "Simulation of sufficient markets for public fishery resources."

April 2 - Dr. Danny Weihs, Fluid Dynamicist, Department of Aeronautical Engineering, Technion, Israel, NASA AMES Research Center, gave a talk on "Hydromechanics of fish migration."

18 - Dave Mackett, Planning Officer, presented a talk, "We have to stop meeting like this" as part of the Federal Women's Program.

Tiburon Laboratory

April 8 - Jerry Norton, Pacific Environmental Group, NMFS, Monterey, California, spoke on "El Niño and its oceanic climate setting over the last 12 years." The Tiburon Seminar Series is a cooperative effort of the Paul F. Romberg Tiburon Center for Environmental Studies (San Francisco State University) and the Tiburon Laboratory.

VISITORS

Honolulu Laboratory

March 13 - Dr. Yoshitsugi Hokama, University of Hawaii, visited Richard Shomura, and Drs. Boehlert, and Paul L. Jokiel to discuss ciguatera research.

14 - Cdr. Lawrence Keister, Commanding Officer, Townsend Cromwell, and John Lund, Port Engineer, Pacific Marine Center, discussed vessel equipment with Richard Shomura, Drs. Boehlert, Wetherall, Skillman, and Howard O. Yoshida, Chief, Publications Service.

18-21 - The Collaborative Research Support Program Pond Dynamics/Aquaculture headed by Dr. James Lannan, Oregon State University, and a group of associated scientists from a large project supported by the U.S. Agency for International Development held meetings at the Honolulu Laboratory to plan future research activities.

20 - Dr. William G. Pearcy, Oregon State University, and Dr. Takahisa Nemoto, Ocean Research Institute, Tokyo, visited Dr. Boehlert.

21 - Dr. Muneo Okiyama, Ocean Research Institute, visited Dr. Boehlert to discuss seamount fauna, particularly Maurolicus muelleri.

27-29 - David J. Mackett, SWFC La Jolla, visited the Honolulu Laboratory to facilitate the seamount planning meeting.

April 19 - Captain Kris Knutsen of the F/V Aleutian Spray discussed potential seamount fisheries resources with Dr. Boehlert.

21-26 - Carolyn Riley-Payne, WASC, met with Richard Shomura on April 21. She was at the Laboratory from April 22-26 for a personnel program visit and for a review of a position classification maintenance. Boehlert introduced her to the staff at a general staff meeting on April 22.

26 - Dr. David Somerton, NWAFC, visited Dr. Boehlert to discuss seamount research.

La Jolla Laboratory

March 18-22 - Sharon Lundin, Chief, Employment Development Branch, Personnel Division, WASC, visited the Center.

21 - Mr. Satoru Nagata, Section Chief of Planning and Promotion Section, Fishery Division of Agriculture Department, the Kanagawa Prefectural Government, Yokohama, Japan, visited Director Barrett, Gary Sakagawa, and Reuben Lasker to discuss fishery resources research.

22 - Dr. Lee Anderson, Economist at the University of Delaware, visited the Center to discuss fisheries economics research with SWFC and SWR economists.

April 26 - Mr. Roland Kinney, Program Administrator, National Research Council, Washington, D.C., visited the Center.

Pacific Environmental Group

March 6 - Izadore Barrett and John Carr visited PEG.

14 - Dr. Larry Breaker of the Navy Postgraduate school visited with Doug McLain and Rusty Brainard. Breaker is working on a study of the correlation time and space scales of coastal SST observations at three California coastal observing stations (Farallon Islands, Granite Canyon and Scripp's Pier).

26 - Terri Dickerson and Patty Wolf of California Department of Fish and Game visited Donna Mallicoate, Jan Mason and Dick Parrish of PEG to discuss joint research papers on mackerel and sardines and joint programming and database efforts in progress.

April 1 - Dr. Marc Mangel of the UC Davis Math Department visited with Roy Mendelssohn of PEG and Philippe Cury, visiting scientist from ORSTOM. Dr. Mangel is interested in borrowing some of Cury's West Africa fishery data because he has a new method of estimating the abundance of pelagic fishes without CPUE data.

18 - Nelson Ross, NODC representative in La Jolla visited PEG on his annual trip up the coast to inquire about data accessions.

25 - Jim Hardwick of California Department of Fish and Game visited Lt. Patrick Rutten of PEG to explore possibilities of cooperative effort to correlate landings and growth time series with environmental data series.

26 - Mr. Ed Melvin of the University of California Marine Advisory Service, Sea Grant, in Watsonville, California, visited PEG to obtain environmental data to support an investigation of high coliform counts in oysters in Morro Bay Harbor.

Tiburon Laboratory

March 4 - Yoshihachiro Nimura of Tokyo University, and Ryuzo Oyama and Yoshiaki Arai of the Japan Fisheries Resource Conservation Association.

5 - K. Takayama.

7 - Izadore Barrett and John Carr, Southwest Fisheries Center. Dr. Barrett addressed staff and presented length-of-service awards.

15 - Pete Kalvass, California Department of Fish and Game, Menlo Park, California.

April 4 - Tokihide Ichinose, A.B.S. Fishing Company.

8 - Ray Wong, U.S. Geological Survey, Menlo Park.

11 - Candace Turner, Linda Nalin, Patty Druce, Dan Graham, and Carol Thomas from WASC Personnel in Seattle, conducted a personnel review.

MEETINGS AND TRAVEL

Honolulu Laboratory

March 1- 9 - At the request of the Marshall Islands Government, Richard Shomura participated with Peter Milone, Western Pacific Program Office, SWR, Dr. Gerald Posner, and Robin Tuttle in a team review of fishery development opportunities in the Marshall Islands. Meetings were held with President Kabua, several Cabinet Ministers, other government officials, and representatives of the local business community.

12 - Richard Shomura attended a College Hill breakfast meeting called by Acting University of Hawaii President Albert J. Simone.

15 - Dr. Boehlert attended a meeting of the Coordinating Council for Research on Seafloor Processes, University of Hawaii, of which he is a member. He described the seamount program and other Honolulu Laboratory studies relevant to the interests of the Council.

15 - Dr. Skillman represented Richard Shomura at the 20th meeting of the Hawaii Fisheries Coordinating Council at the board room of the Department of Land and Natural Resources.

18-19 - Richard Shomura and William G. Gilmartin participated in a marine mammal meeting at the SWFC to develop specific research on net entanglement problems.

18-20 - Dr. Boehlert and M. Seki attended the U.S.-Japan cooperative science meeting on Zoogeography of the Subarctic Pacific at the East-West Center.

March 18-April 2 - David C. Hamm, Computer Systems Analyst, visited Yap on travel supported by the Yap State Marine Resources Division (MRD) to install a microcomputer at the MRD office and train personnel on its applications.

23-24 - Samuel G. Pooley, Industry Economist, attended the semiannual meeting of the SWFC and the Southwest Region economists in La Jolla to discuss FY 1985 year-end and FY 1986 economics projects.

26 - Dr. Boehlert attended a workshop, which was held at the Hilton Hawaiian Village Hotel, to define the activities and design of the Hawaiian Ocean Center.

La Jolla Laboratory

March 4- 8 - Ben Remington traveled to Washington, D.C., to participate in an A-76 workshop.

4- 8 - Sandra Hawes and Randy Rasmussen tagged and censused elephant seals on Santa Barbara Island.

6- 8 - Izadore Barrett and John Carr went to Monterey and Tiburon, California, to discuss administrative and programmatic matters with the Chief of PEG and the Director of the Tiburon Laboratory, and to Bodega Bay, California, to discuss joint research with University of California scientists.

8-11 - Chuck Oliver and Jeanne Wexler tagged northern elephant seals on San Clemente Island.

10-12 - Dan Huppert traveled to Portland, Oregon, for a meeting of the Pacific Fishery Management Council's Scientific and Statistical Committee.

10-13 - Izadore Barrett attended the Pacific Council's Scientific and Statistical Committee meeting and west coast Groundfish Planning meeting in Portland, Oregon.

10-13 - Gary Sakagawa traveled to Miami, Florida, to attend an ICCAT planning meeting.

11-13 - Norm Bartoo attended the ICCAT planning meeting in Miami, Florida.

18 - Ron Dotson presented a talk on techniques and results of experimental fisheries project in Horta, Azores, Portugal. The project was conducted in the Azores from September to December 1984.

18-20 - Izadore Barrett attended the NMFS Research Council meeting in Miami, Florida.

26-30 - Dave Mackett traveled to Honolulu, Hawaii, to conduct planning meeting for seamount research.

27-29 - Dan Huppert participated in a joint meeting of the Pacific Coast Limited Access Working Group in San Francisco.

28 - Izadore Barrett traveled to San Francisco to participate in a joint meeting of the Pacific Coast Limited Access Working Group.

April 8- 9 - Izadore Barrett and Dan Huppert attended the Pacific Council's Scientific and Statistical Committee meeting in Portland, Oregon.

18-30 - Tim Smith traveled to Bonn, West Germany, to attend a symposium on Scientific Requirements for Antarctic Conservation and to London, England, to visit fisheries laboratories.

April 19 - Reuben Lasker traveled to Bonn, West Germany,to attend a symposium on Scientific Requirements for Antarctic Conservation and to London, England, to visit fisheries laboratories.

20-28 - John Hunter visited Kaohsiung, Taiwan, to attend a consultation on milkfish reproduction.

Pacific Environmental Group

March 8-22 - PEG Director Andy Bakun traveled to Paris, France and Barcelona, Spain. Bakun is Chairman of the Guiding Group

of Experts for the IOC/FAO Program on Ocean Sciences in Relation to Living Resources (OSLR); he presented the OSLR program to the Intergovernmental Oceanographic Commission (IOC) General Assembly in Paris. In Barcelona Bakun gave a lecture at the Instituto de Investigaciones Pesqueras de Barcelona entitled, "Environmental Processes and Recruitment Variation."

April 9 - Jerry Norton traveled to Tiburon to present a seminar entitled, "California El Niño and its Ocean Climate Context." Dick Parrish and Philippe Cury accompanied Norton to meet with Tiburon staff to discuss topics of mutual interest.

Tiburon Laboratory

March 7 - Norman Abramson, Wally Giguere, Izadore Barrett, and John Carr met with Eric Anderson, Associate Director of the Paul F. Romberg Tiburon Center for Environmental Studies, and Dean Parnell, San Francisco State University Planning Office, on matters related to operation of the Tiburon facilities.

7- 8 - Edward Ueber attended a conference in Newport, Oregon, on limited entry and gave a talk on alternative groundfish management.

8- - Izadore Barrett, John Carr, Norman Abramson, and Mickey Eldridge traveled to UC Davis' Bodega Marine Laboratory and met with Laboratory Director Cadet Hand and Assistant Director Paul Siri. They toured the Laboratory and examined the wet lab facilities the Tiburon Laboratory is renting.

10-14 - Ted Hobson, Tony Chess, and Dan Howard traveled to Catalina Island to monitor the marine habitat.

13-16 - Sus Kato traveled to Santa Barbara to board the commercial fishing vessel Gus-D.

18 - Norman Abramson and Bill Lenarz met at the Northwest and Alaska Fisheries Center with Murray Hayes, Robert Francis, Tom Dark, and Richard Marasco concerning coordination of groundfish research.

April 8-10 - Norman Abramson attended the meeting of the Pacific Fishery Management Council's Scientific and Statistical Committee in Portland.

15 - Norman Abramson traveled to the Southwest Fisheries Center in La Jolla to attend the Groundfish Planning session of the Coastal Division.

22-25 - Ted Hobson traveled to Florida to attend a program review sponsored by the NOAA Office of Underwater Research.

25 - Dave Woodbury met with John Butler and Susan Longinotti at the La Jolla Laboratory to discuss techniquesfor aging juvenile rockfish otoliths.

April 30 - Bill Lenarz and Joe Hightower visited all ports between San
May 2 Francisco and Coos Bay, Oregon, meeting with fishermen, processors, and state fisheries personnel

PERSONNEL

Honolulu Laboratory

March 2 - Paul L. Jokiel, Fishery Biologist (Research) - Full-Time - Temporary Appointment

- Robert J. Morrow, Biological Technician (Wildlife) - Full-Time - Temporary Appointment.

- Joseph W. Schulz, Library Technician - Part-Time - Temporary Appointment.

11 - Doris J. Alcorn, Wildlife Biologist - Full-Time - Temporary Appointment.

- Jimmy R. Baxter, Computer Assistant - Part-Time - Temporary Appointment.

- Christofer H. Boggs, Fishery Biologist - Full-Time - Permanent Appointment.

- Robert G. Forsyth, Biological Technician (Wildlife) - Extension of Temporary Appointment.

12 - Robin L. Westlake, Biological Technician (Wildlife) - Extension of Temporary Appointment.

17 - Julie J. Ellason, Biological Technician (Wildlife) - Full-Time - Temporary Appointment.

- Carol M. Fujisawa, Biological Aid - Full-Time - Temporary Appointment.

- Thea C. Johanos-Kam, Wildlife Biologist - Full-Time - Temporary Appointment.

- Alan K. H. Kam, Biological Technician (Wildlife) - Intermittent Temporary Appointment.

- Bruce C. Mundy, Fishery Biologist - Full-Time - Temporary Appointment.

19 - Lynn M. Hondonero, Clerk-Typist - Extension of Part-Time - Temporary Appointment (Stay-in-School).

23 - Fred Frizelle, III, Computer Clerk - Extension of Part-Time - Temporary Appointment.

28 - Marc A. Webber, Biological Technician (Wildlife) - Full-Time - Temporary Appointment.

April 1 - Tamotsu Nakata, Scientific Illustrator - Voluntary Retirement.

10 - Roy L. Bendell, Biological Aid (Fisheries) - Full-Time - Temporary Appointment.

11 - Yara Lamadrid-Rose, Biological Technician (Fisheries) - Extension of Temporary Appointment.

14 - Raymond P. Clarke, Biological Technician (Fisheries) - Conversion to Temporary Appointment.

- Alton W. Chung, Biological Technician (Fisheries) - Full-Time - Temporary Appointment.

15 - Lance S. Asagi, Biological Aid (Fisheries) - Extension of Temporary Appointment.

28 - George H. Balazs, Zoologist - Full-Time - Permanent Appointment.

- Ellen S. Hayakawa, Computer Clerk - Extension of Temporary Appointment.

- Robin L. Westlake, Biological Technician (Wildlife) - Conversion to Temporary Appointment.

La Jolla Laboratory

March 2 - Jay Walker, Computer Systems Programmer - Entered on Duty.

15 - Lisa Lau, Biological Science Student Trainee - Resignation.

31 - Aaron Weinfield, Computer Clerk - Entered on Duty.

April 9 - Joseph Joy, Computer Programmer - Entered on Duty.

14 - Richard Lindsay, Biological Technician - Entered on Duty.

15 - Robert Karnstein, Computer Programmer - Entered on Duty.

- Frances Mann, Biological Aid - Entered on Duty.

Pacific Environmental Group

April 15 - Thang (Tom) Pham reported for work at PEG as a Temporary Oceanographer.

- Lt. Patrick Rutten (NOAA Corps) reported for a short tour of duty at PEG. Lt. Rutten will be detailed to PEG until he reports for classes at the Naval Postgraduate School in Monterey on July 8.

Tiburon Laboratory

March 1 - Rebecca Hoff, Statistical Assistant - Entered on Duty.

3 - Sharon L. Moreland, Biological Technician - Conversion to Career Appointment.

31 - David Woodbury, Biological Aid - Conversion to Career Appointment.

STATUS OF PUBLICATIONS

Published

Harrison, Craig S., Thomas S. Hida, and Michael P. Seki. 1984. The diet of the brown booby Sula leucogaster and masked booby Sula dactylatra on Rose Atoll, Samoa. Ibis 126:588-590. [No abstract.]

Moser, Mike, Judy A. Sakanari, Carol A. Reilly, and Jeannette Whipple. 1985. Prevalence, intensity, longevity, and persistence of Anisakis sp. larvae and Lacistorhynchus tenuis metacestodes in San Francisco striped bass. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 29, 4 p.

Thirteen hundred and seventy-three striped bass, Morone saxatilis, were collected from the San Francisco Bay-Delta area to correlate host diet with parasitic infections and to determine the prevalence, intensity, longevity, and persistence of larval Anisakis sp. nematodes and the metacestode Lacistorhynchus tenuis. There is an increase in the prevalence and intensity of Anisakis sp. and in the intensity of L. tenuis with increase of age of the host. These increases are probably related to the diet and the persistence of the parasites. The infections of both species are overdispersed. San Francisco Bay striped bass are an incompatible host for both species of parasites. Degenerated Anisakis sp. will remain in the host for at least 8 months and L. tenuis metacestodes for 22 months. The occurrence of several other species of parasites and a tumor is also reported.

Polovina, Jeffrey J. 1984. Model of a coral reef ecosystem. I. The ECOPATH model and its application to French Frigate Shoals. Coral Reefs 3:1-11.

A simple model, termed ECOPATH, is presented which is used to estimate mean annual biomass, production, and consumption for components of an ecosystem. To use the model, the ecosystem must be partitioned into groups of similar species and provide estimates of production to biomass, diet, and food consumption for these species groups. The ECOPATH model was applied to an ecosystem at French Frigate Shoals in the Northwestern Hawaiian Islands. Extensive field work provides both estimates of the input parameters as well as estimates of mean annual biomass and production. Biomass and production estimates for some of the species groups modeled are used to validate the estimates generated by the model.

Ralston, Stephen. 1985. A novel approach to aging tropical fish. ICLARM Newsletter 8(1):14-15. [No abstract.]

Walker, Michael M. 1984. Learned magnetic field discrimination in yellowfin tuna, Thunnus albacares. J. Comp. Physiol. A155:673-679.

Yellowfin tuna, Thunnus albacares, were trained individually to discriminate between two Earth-strength magnetic fields by differential reinforcement of a swimming response.

Seven subjects (of which two were trained with a double blind procedure designed to control for the possibility of cues from the experimenter) learned to discriminate between ambient and altered fields. Two additional fish trained with the same double blind procedure failed to discriminate between two magnetic fields in which the gradients of intensity were equal and opposite.

The results suggest that the responses to magnetic fields by yellowfin tuna are neurally mediated and that magnetic field detection by this species can be analyzed by the same means as other sensory modalities.

Approved by Center Director

Balazs, George H. History of sea turtles at Polihua Beach on northern Lanai. 'Elepaio.

Balazs, George H. Ontogenetic changes in the plastron pigmentation of hatching Hawaiian green turtles. Herpetologica.

Balazs, George H. Status and ecology of marine turtles at Johnston Atoll. Atoll Res. Bull.

Boehlert, George W. and Michael P. Seki. Seamounts induce variability in mid-ocean pelagic ecosystems.

Hirsch, Nina D., Jeannette A. Whipple, and Pete E. Benville, Jr. Introduction of monocyclic aromatics into seawater by an outboard motor. For submission to Environ. Monit. Assess.

Lenarz, William H. Comparison of two methods of describing the dynamics of a cohort of fish that is incompletely recruited to the fishery. For submission to Can. J. Fish. Aquat. Sci.

Lenarz, William H. Theoretical first approximations of densities of discarded webbing in the eastern North Pacific Ocean and Bering Sea. For submission to Proceedings of the Workshop on Fate and Impact of Marine Debris, Honolulu, HI.

Lenarz, William H. and Tina Wyllie Echeverria. Comparison of visceral fat and gonadal volumes of Sebastes flavidus during a normal year and a year of El Niño conditions. For submission to Fish. Bull., U.S.

Lowry, Mark S. Using California sea lions (Zalophus californianus) for estimating abundance of their prey. For publication in CalCOFI Reports.

MacCall, Alec D. A fast generalized VPA algorithm and a new close linear approximation. Canadian Journal of Fisheries and Aquatic Sciences.

Wolf, Patricia and Paul E. Smith. An inverse egg production method for determining the relative magnitude of Pacific sardine spawning biomass off California. For publication in CalCOFI Reports.

Zug, George R. and George H. Balazs. Skeletochronological age estimates for Hawaiian green turtles. Mar. Turtle Newsl.

Administrative Report

Polovina, J. J., R. B. Moffitt, S. Ralston, and P. M. Shiota. 1985. Results of the resource assessment investigation of the Mariana Archipelago, 1985. SWFC Admin. Rep. H-85-7.

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